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A Message from the President Designate

On behalf of the Members and Council of the Institute of British Foundrymen, I gratefully take the opportunity afforded me by the "Foundry Trade Journal" to extend to everybody attending the International Foundry Congress a very hearty welcome.

The Congress has been organised with the object of bringing together people of all nationalities interested in the production of castings so that the foundry industry may make greater contributions to the progress of industry in general.

As all industrial progress entails the full co-operation between management and labour, science and practical experience, and as all these activities are well represented, my welcome is extended to you as executives, scientists, metallurgists and operatives, rather than because accident of birth has given you a label of nationality. Nevertheless it is my fervent hope that through personal contact a real contribution will be made to a better understanding between the nations represented.

W. B. Lake

President Designate.

Au nom des Membres et du Conseil de l'Institute of British Foundrymen, il m'est fort agréable de profiter de l'occasion que m'offre le FOUNDRY TRADE JOURNAL *de souhaiter à tous ceux qui vont participer au Congrès International de la Fonderie la plus cordiale bienvenue.*

Le Congrès a été organisé dans le but de réunir des gens de toutes nationalités qui s'intéressent à la fabrication des pièces de fonderie, de sorte que l'industrie de la fonderie puisse contribuer encore davantage au progrès de l'industrie en général.

Etant donné que tout progrès industriel exige une entière coopération entre la direction et la main-d'œuvre, entre la science et l'expérience pratique, et comme toutes ces diverses branches sont bien représentées, ma bienvenue s'adresse à vous en vos qualités respectives de dirigeants, de savants, d'ingénieurs et d'artisans, plutôt que parce que le hasard de la naissance vous a donné telle ou telle nationalité. De toute façon, j'ai le fervent espoir que le contact personnel contribuera ainsi à favoriser une meilleure entente entre les nations représentées.

Namens und im Auftrag der Mitglieder und des Vorstandes des Institute of British Foundrymen ergreife ich dankbar die Gelegenheit, die mir durch das FOUNDRY TRADE JOURNAL *gewaehrt wurde, jedem einzelnen der zu dem Internationalen Giesserei Kongress erschienen ist, ein herzliches Willkommen zu entbieten.*

Der Kongress ist mit dem Gedanken organisiert worden, die Menschen aller Nationen zusammen zu bringen, die an der Guss-Produktion interessiert sind, sodass die Giesserei-Industrie einen groesseren Beitrag zum Fortschritt der Industrie im allgemeinen leisten moege.

Da jeder industrielle Fortschritt die volle Mitarbeit zwischen Fuehrung und Arbeit, Wissenschaft und praktischer Erfahrung erfordert und alle diese Zweige hier so hervorragend vertreten sind, gilt mein Willkommensgruss Ihnen als Unternehmer, Wissenschaftler, Metallurgen und Arbeiter mehr, als der einzelnen Nationalitaet die ja nur ein Zufall der Geburt ist. Nichtsdestotrotz ist es mein gluehender Wunsch, dass durch persoenlichen Kontakt ein wirklicher Beitrag zu gegenseitigem besseren Verstaendniss zwischen den Nationen geleistet wird, die hier versammelt sind.

600 Delegates Will Be in London for the World Congress Next Week

TEN years have passed since an International Foundry Congress was held in London. In that time the great city has changed little; but the foundry industry itself has undergone a remarkable transformation. Tremendous strides have been made in the fields of metallurgical knowledge, mechanical efficiency, national and international co-operation. All these changes will be reflected in the Congress which opens in London next Tuesday. It has been planned by the Institute of British Foundrymen, over the past several months, on a far more ambitious scale than has ever before been attempted, and every detail of organisation is now in readiness for the event.

Already overseas delegates have been arriving in a steady stream, and they are assured of a very warm welcome from their British colleagues, so many of whom have been similarly welcomed when attending foundry congresses in other countries abroad. We have no doubt that bonds of friendship will be either strengthened or newly formed just as on those occasions.

We have said that London has changed but little in the last decade. Since the 1929 Congress, however, there has risen in Park Lane, overlooking Hyde Park, the great block of the Dorchester Hotel, and this modern, finely-equipped hotel has been selected as the headquarters of the Congress. It is here that many of the events on the programme will take place. Incidentally it will be used by the Institute of British Foundrymen, on the day before the Congress opens, for its own 37th annual conference, when new officers will be elected and "domestic" business transacted.

More than 550 people will be present when the Lord Mayor of London (Sir Frank Bowater, Kt.) declares the Congress officially open. His performance of that ceremony will be a token of the recognition by the Civic Authorities of the city of the importance of the work of the Congress and, indeed, of their interest in it. He will no doubt refer to the value of such gatherings from the aspect of international friendship, and with this view Dr. Guido Vanzetti, who is President this year of the International Committee of Foundry Technical Associations, will whole-heartedly agree when he replies on behalf of the overseas visitors. The induction of the new President and Vice-Presidents of the Institute of British Foundrymen will follow, and Mr. W. B. Lake, J.P., will then deliver his Presidential Address on "The Evolution of the Steel Foundry." Himself a pioneer maker of electric-steel castings, he should make a particularly noteworthy survey of the subject. The remainder of the morning will be devoted to the reading of the Fourth Edward Williams Lecture—on this occasion to be delivered by no less eminent a physicist than Professor W. L. Bragg, who is Director of the famous Cavendish Laboratory in the University of Cambridge, and whose theme will be "The Atomic Pattern of Metals."

Presentation and discussion of technical Papers will occupy the afternoon, as well as other sessions on Wednesday and on Friday, and herein will lie much of the permanent value of the Congress. Little need be said of the Papers here, for advance copies of most of them are already in the delegates' hands. We may remark on the fact, however, that they number nearly 40, by authorities of a dozen different nationalities, and that there are few major branches in foundry practice that are not dealt with. This is a matter for congratulation, since the technical Papers will always form the backbone of any foundry congress. Especially worthy of note are two sessions. One will be devoted entirely to matters of interest to the non-ferrous metal founder, and the second will take the form of a joint meeting with the Iron and Steel Institute. The Steel Castings Research Committee of that Institute have contributed invaluable reports to the literature of steel foundry work over the past few years, and it is a gracious compliment, as well as an act of wisdom, that they should be invited to take part in any discussion on Papers relating to steel founding. Actually the Congress has provided half-a-dozen Papers on this subject.

The Reception which will be given by His Majesty's Government on Tuesday evening will be an event of the greatest encouragement to the British members of the Congress, for it will be the first occasion on which the State has made a gesture confirming its appreciation of the basic position which the foundry industry occupies in the industrial structure of the Empire. Lancaster House itself, standing close to the Green Park, acts as a most fitting setting for the function. The guests are to be received by the Rt. Hon. the Lord Runciman, P.C., Lord President of the Council, and Lady Runciman, and during the evening they will be able to see something of the fascinating collection which goes to make up the London Museum, and which is actually housed in this splendid building.

The work of the Congress is diverted into a different channel on Wednesday afternoon, when any one of six works is open to the delegate. No matter which has been his choice, he is assured of an instructive afternoon. Illustrated accounts of the works to be visited during the Congress are given elsewhere in this issue of the JOURNAL. J. & E. Hall produce castings in iron and non-ferrous metals for use in the refrigerating machines for which they are so well known. Three of the works—Ealing Park Foundry; Sterling, and R. & A. Main—are engaged in iron founding, the first operating a special process of making high-duty iron, while the other two are experts in the production of domestic equipment and use the vitreous enamelled finish for a large proportion of their manufactures, although this side of their activities we have done no more than mention in our descriptions. The remaining works are non-ferrous foundries which, because of the nature of the articles they make, are worlds apart. Gillett & Johnston cast bells which are sent to all parts of the world, and the traditional methods of moulding are

CONGRESS HEADQUARTERS—THE DORCHESTER HOTEL IN PARK LANE, OVERLOOKING HYDE PARK.

still largely employed. On the other hand, Glacier Metal Company are one of the first non-ferrous concerns to lay down a mechanised foundry to aid them in turning out their anti-friction metals and bearings.

In the evening of Wednesday is one of the outstanding events of the whole week—the Congress Banquet at the Dorchester Hotel. As they arrive the delegates and their ladies will be received by Mr. W. B. Lake, the President of the Institute of British Foundrymen, and Mrs. Lake, and by Dr. Guido Vanzetti, President of the International Committee of Foundry Technical Associations, and Signora Vanzetti. The Banquet itself begins at 7.30 p.m., and the Rt. Hon. Oliver Stanley, President of the Board of Trade, will be the Guest of Honour. When the speeches are over—and at these international banquets, in no matter what country they are held, the oratory is invariably eloquent and brilliant—dancing will follow until 1.0 a.m. in the morning. This is an innovation for an international Congress in this country, and it will undoubtedly be welcomed by everybody, not least by the ladies.

Three whole-day and two half-day visits have been arranged for Thursday. At Ipswich, one of the oldest and most prosperous of the East Anglian towns, inspection will be made of Crane's works in the morning—the firm is one of the best-known radiator foundries in the country—and after lunch E. R. & F. Turner's works, which are concerned with the manufacture of flour-mill machinery, will be visited. The second trip is to Dunstable, where Bagshawe & Company's foundries will be seen; they cater principally for the firm's needs in the making of conveyors. While the gentlemen are thus engaged the ladies will have been looking over a straw-hat factory in Luton, and the two parties will unite at luncheon and afterwards spend a few hours in the delightful surroundings of Whipsnade Zoo, where in open-air enclosures spreading many acres over the Downs is almost as large a collection of wild animals as in the London Zoological Gardens. Finally, another party of delegates will board the motor-vessel "Royal Princess" and proceed down the River Thames from Westminster Pier, through the Pool of London which is always the scene of immense shipping activity, and so to Dagenham, where they will have several hours in which to make a thorough examination of the great Ford motor-car works.

The half-day visits are, in the forenoon, to Belling & Company at Enfield where electric heaters and cookers are turned out in great numbers, varieties and finishes, and, after luncheon, to the National Physical Laboratory at Teddington, the famous centre for research and routine testing in the fields of metallurgy and engineering as well as in many other sciences.

Once again, in the evening, the delegates and their ladies will gather at the Dorchester, this time to participate in the Reception and Dance to which they are invited by Mr. and Mrs. Lake. Once again they may confidently look forward to a most enjoyable function, and certainly a very hearty and sincere welcome from the President and his wife. Amongst the evening's attractions will be the sparkling "Dorchester Floor Show" cabaret, and Maurice Winnick and his band.

CONGRESS PATRONS

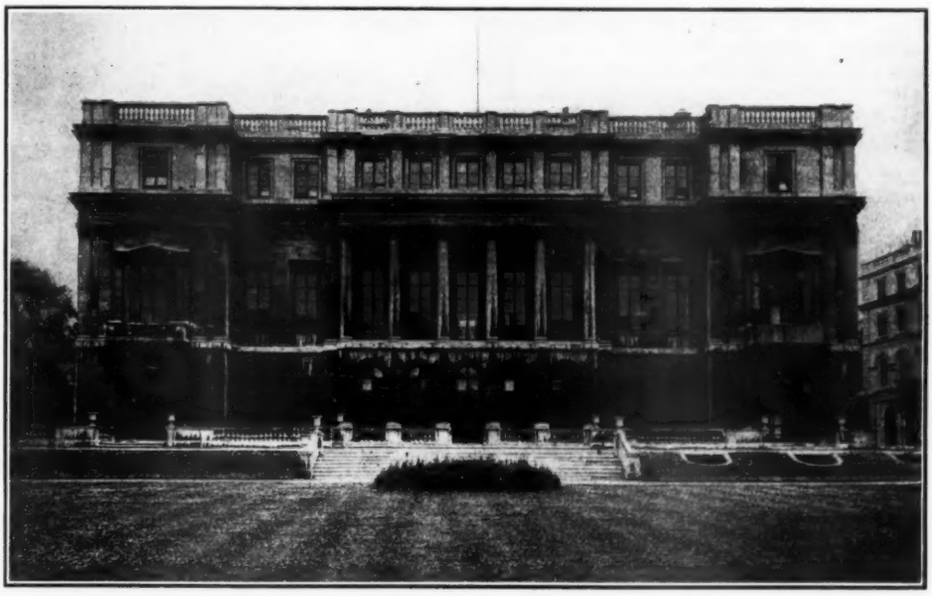
THE RT. HON. OLIVER STANLEY, M.C., M.P., President of the Board of Trade.
THE RT. HON. THE EARL OF DUDLEY, M.C., T.D
THE RT. HON. THE VISCOUNT GREENWOOD OF HOLBOURNE, P.C.
THE RT. HON. THE VISCOUNT WEIR OF EASTWOOD, P.C., G.C.B.
THE RT. HON. LORD ABERCONWAY, C.B.E.
THE RT. HON. LORD AUSTIN OF LONGBRIDGE, K.B.E., LL.D.
THE RT. HON. LORD HIRST OF WITTON.
THE RT. HON. LORD McGOWAN, K.B.E.
THE RT. HON. LORD RIVERDALE, K.B.E.
THE RT. HON. LORD STAMP OF SHORTLANDS, G.C.B., G.B.E.
LT.-COL. SIR JAMES LITHGOW, BT., M.C., T.D.
SIR WILLIAM BRAGG, O.M., K.B.E., P.R.S.
PROFESSOR SIR HAROLD CARPENTER, M.A., PH.D., F.R.S., A.R.S.M.
COMMANDER SIR CHARLES W. CRAVEN, O.B.E., R.N.
SIR ANDREW DUNCAN.
SIR NIGEL GRESLEY, C.B.E., D.SC.
BRIG.-GEN. SIR HAROLD HARTLEY, C.B.E., M.C., F.R.S.
SIR WILLIAM LARKE, K.B.E.
SIR FELIX POLE.
PROF. W. L. BRAGG, O.B.E., M.A., D.SC., F.R.S.
C. H. DESCH, ESQ., PH.D., D.SC., F.R.S.
E. J. FOX, ESQ., M.I.Mech.E.
H. J. GOUGH, ESQ., M.B.E., D.SC., PH.D., F.R.S.
LT.-COL. J. H. M. GREENLY, C.B.E., M.A., M.I.E.I.
H. MOORE, ESQ., C.B.E., D.SC.
J. G. PEARCE, ESQ., M.SC., M.I.E.E., F.Inst.P.

Friday is a day given over to the presentation and discussion of Papers. Almost a dozen are listed for the morning, and in the afternoon will be held the joint meeting with the Iron and Steel Institute to which reference already has been made. Incidently, although it is open only to its Committee members, we may mention the meeting of the International Committee of Foundry Technical Associations which is to be held in the morning. Not only does this Committee arrange the venue for International Congresses but it also undertakes the direction of committees on such subjects as the testing of cast iron, foundry defects and standardisation. At the conclusion of the deliberations, a wreath will be laid on the tomb of the Unknown Warrior in Westminster Abbey, in the name of the International Committee.

And so, at 5.30 p.m. on Friday, the Congress will bring its work to a close, without any elaborate ceremony, such as is customary with foreign meetings. Only the excursion on Saturday will remain to round off what will have been a very strenuous programme. The outing to Windsor Castle and the trip on the Thames should be a memorable occasion. Windsor Castle itself, famous as the residence of the British Sovereign, and founded by William the Conqueror, is a wonderful sight, while on the steamer trip up-river to Bourne End, some of the loveliest reaches of the river will be passed.

These few notes summarise what will be taking place in London during Congress Week. Immediately to follow it has been arranged the comprehensive Post-Congress Tour, which represents for the overseas visitor a splendid opportunity to improve his knowledge of the foundry industry as it is practised nationally, and at the same time to combine with it a chance of seeing some of the historic cities and scenic beauties of this island of ours. As they travel northwards, so the local Branches of the Institute of British Foundrymen will welcome them and entertain them. Extended reference to this tour is made on another page.

We have stressed the official side of the Congress programme, but we cannot refrain from closing by saying what must be in the minds of all British foundrymen who have travelled abroad to attend similar functions. That is, that as individuals we look upon this Congress as an occasion when we can reciprocate that courtesy, helpfulness and most generous private hospitality with which we are then met. Many of the visitors will be old friends of long standing. The newcomers will, we hope, give us the opportunity of becoming better acquainted with them.



LANCASTER HOUSE—THE SCENE OF THE GOVERNMENT RECEPTION NEXT TUESDAY EVENING.

FINAL DETAILS of the PROGRAMME

The Congress Headquarters is at the Dorchester Hotel, Park Lane, W.1. Except where stated otherwise below, all Congress functions will be held therein and excursions will start therefrom. A Registration Office and Information Bureau will be open at these headquarters at the following times. Monday, 10 a.m. to 5 p.m.; Tuesday, 9 a.m. to 5 p.m.; Wednesday, 9.15 a.m. to 2.30 p.m.; Thursday, 9.15 a.m. to 12 noon; Friday, 9.15 a.m. to 2.30 p.m.

Sunday, June 11

3.00 p.m.—GARDEN PARTY to meet overseas delegates and ladies.

By kind invitation of Mr. Barrington Hooper, C.B.E., and Mrs. Hooper, at their home, Southward, Mount Park, Harrow. Coaches leave Dorchester Hotel, for Harrow, at 2.15 p.m., arriving back at about 7.30 p.m.

Monday, June 12

11.00 a.m. to **5.00** p.m.—COMMITTEE AND COUNCIL MEETINGS of the INSTITUTE OF BRITISH FOUNDRYMEN.

5.30 p.m.—ANNUAL GENERAL MEETING of the INSTITUTE OF BRITISH FOUNDRYMEN (Members only).

Tuesday, June 13

9.45 a.m.—OPENING OF THE CONGRESS.

OFFICIAL OPENING CEREMONY in the Ballroom, by THE RT. HON. THE LORD MAYOR OF LONDON (SIR FRANK BOWATER, Kt.).

REPLY ON BEHALF OF OVERSEAS DELEGATES BY DR. GUIDO VANZETTI (President, International Committee of Foundry Technical Associations).

PRESENTATION of the OLIVER STUBBS GOLD MEDAL and the E. J. FOX GOLD MEDAL.

VOTE OF THANKS TO THE LORD MAYOR OF LONDON by MR. J. HEPWORTH, J.P., M.P. (President, The Institute of British Foundrymen).

INDUCTION of the new PRESIDENT AND VICE-PRESIDENTS of the Institute of British Foundrymen.

11.15 a.m.—PRESIDENTIAL ADDRESS. "The Evolution of the Steel Foundry," by MR. W. B. LAKE, J.P.

11.45 a.m.—THE FOURTH EDWARD WILLIAMS LECTURE:—

"The Atomic Pattern of Metals," by PROFESSOR W. L. BRAGG, O.B.E., D.Sc., M.A., F.R.S., Nobel Laureate, Director, The Cavendish Laboratory in the University of Cambridge.

1.15 p.m.—BUFFET LUNCHEON in the Park Suite. (*Stewards will wear white rosettes.*)

2.30 p.m.—TECHNICAL SESSION.

PRESENTATION AND DISCUSSION IN BALLROOM of Papers Nos. 658, 659, 660, 661, and 662. (For details, see page 478.)

4.30 p.m.—MEETING OF THE INTERNATIONAL COMMITTEE ON TESTING CAST IRON. (Committee members only.)

5.30 p.m.—CONGRESS ADJOURNS.

10.00 p.m.—RECEPTION BY HIS MAJESTY'S GOVERNMENT.

The Rt. Hon. the Lord Runciman, P.C. (Lord President of the Council), and Lady Runciman will receive the guests at Lancaster House, London, W.1. (*Evening Dress.*)

Wednesday, June 14

9.30 a.m.—TECHNICAL SESSIONS in Gold Room and Park Suite.

PRESENTATION AND DISCUSSION OF PAPERS Nos. 663, 664, 665, 666, and 694 (Session A); and 667, 668, 669, 670, 689 and 691 (Session B). (For details, see page 478.)

12.45 p.m.—BUFFET LUNCHEON in Ballroom.

2.00 p.m.—WORKS VISITS.

Coaches leave for THE FOLLOWING WORKS:—EALING PARK FOUNDRY, LTD., South Ealing (general ironfounders; Meehanite process). (*Stewards wear red rosettes.*) STERLING MANUFACTURING COMPANY, LIMITED, Cubitt Town (makers of domestic laundry equipment; vitreous enamelling shop). (*Stewards wear light blue rosettes*). R. & A. MAIN, LIMITED, Upper Edmonton (gas-cooker manufacturers; vitreous enamelling shop). (*Stewards wear yellow rosettes.*) GILLETT & JOHNSTON, LIMITED, Croydon (bell founders; non-ferrous foundry). (*Stewards wear green rosettes.*) GLACIER METAL COMPANY, LIMITED, Wembley (general non-ferrous founders; mechanised foundry). (*Stewards wear dark blue rosettes.*) Coaches arrive back at about 5.45 p.m.

2.01 p.m.—WORKS VISIT.

TRAIN departs CHARING CROSS RAILWAY STATION (Platform No. 4) for J. & E. HALL, LIMITED, Dartford (makers of refrigerative apparatus, and escalators; ferrous and non-ferrous foundries). (*Stewards wear orange rosettes.*) Delegates should leave the Dorchester by 1.20 p.m., and will find their own way to Charing Cross Station. The train arrives back at 6.06 p.m.

7.00 p.m.—RECEPTION.

MR. W. B. LAKE, J.P. (President of the Institute of British Foundrymen), and MRS. LAKE, and DR. GUIDO VANZETTI (President of the International Committee of Foundry Technical Associations), and SIGNORA VANZETTI, will receive the guests prior to Annual Banquet.

7.30 p.m.—ANNUAL BANQUET in Ballroom.

Chairman: MR. W. B. LAKE. The Banquet will be followed by dancing until 1.00 a.m. (M.C. is MR. B. B. KENT.) (*Evening Dress.*)

Thursday, June 15

8.15 a.m.—WHOLE-DAY VISIT TO IPSWICH. (*Stewards wear light blue rosettes.*)

8.15 a.m.—DEPART Liverpool Street Station by train. 10.30 a.m.—ARRIVE CRANE, LIMITED, Nacton Works (malleable ironfounders). 12.30 p.m.—LUNCHEON at the AERO CLUB, Ipswich (by kind invitation of Crane, Limited). 1.30 p.m.—DEPART AERO CLUB by motor coach. 1.45 p.m.—ARRIVE E. R. & F. TURNER, LIMITED (flour-mill engineers). 3.00 p.m.—DEPART for sight-seeing tour of Ipswich. 4.45 p.m.—ARRIVE Railway Station. 4.54 p.m.—DEPART IPSWICH by train. 6.32 p.m.—ARRIVE Liverpool Street Station, London.

8.30 a.m.—WHOLE-DAY VISIT TO DUNSTABLE AND WHIPSNADE ZOO. (*Stewards wear orange rosettes.*)

8.30 a.m.—MOTOR COACH DEPARTS. 10.15 a.m.—ARRIVE BAGSHAWE & COMPANY, LIMITED (malleable ironfounders and conveyor makers). 12.00 noon.—DEPART BAGSHAWE & COMPANY, LIMITED. 12.30 p.m.—LUNCHEON AT WHIPSNADE ZOO (by kind invitation of Bagshawe & Company, Limited). At Luncheon, gentlemen will be able to join those ladies who have visited CURRANT & CREAK, LIMITED, Luton, in the morning. During the afternoon, ladies and gentlemen can inspect the Zoo. 4.30 p.m.—DEPART WHIPSNADE ZOO by motor coach, starting from outside the main entrance to the Zoo. 6.30 p.m.—ARRIVE at DORCHESTER HOTEL.

8.45 a.m.—RIVER TRIP AND WORKS VISIT TO DAGENHAM. (*Stewards wear pink rosettes.*)

8.45 a.m.—DEPART WESTMINSTER PIER by m.v. *Royal Princess*, passing through the Port of London. 11.00 a.m.—ARRIVE FORD MOTOR COMPANY, LIMITED, Dagenham (automobile manufacturers). 12.30 p.m.—LUNCHEON by kind invitation of the FORD MOTOR COMPANY, LIMITED. 3.30 p.m.—TEA by kind invitation of FORD MOTOR COMPANY, LIMITED. 4.00 p.m.—DEPART Dagenham. 6.30 p.m.—ARRIVE WESTMINSTER PIER.

9.15 a.m.—WORKS VISIT.

MOTOR COACHES leave for MORNING VISIT to BELLING & COMPANY, LIMITED, Enfield (electric heater and cooker manufacturers; vitreous enamelling plant). (*Stewards wear yellow rosettes.*) Coaches will arrive back at about 12.45 p.m.

2.00 p.m.—VISIT TO NATIONAL PHYSICAL LABORATORY, Teddington.

MOTOR COACHES leave the Dorchester Hotel, and arrive back at about 5.30 p.m. (*Stewards wear red rosettes.*)

8.30 p.m. to **1.00** a.m.—RECEPTION.

By invitation of MR. and MRS. W. B. LAKE, in the Ballroom. M.C. is MR. BARRINGTON HOOPER, C.B.E. (*Evening dress.*)

Friday, June 16

9.30 a.m.—TECHNICAL SESSIONS in Gold Room and Park Suite.

PRESENTATION AND DISCUSSION OF PAPERS Nos. 671, 672, 673, 685, 692, and 695 (Session A); and 675, 676, 677, 678, 679, and 693 (Session B). (For details, see page 478.)

11.30 a.m.—MEETING OF THE INTERNATIONAL COMMITTEE OF FOUNDRY TECHNICAL ASSOCIATIONS. (Committee members only.)

12.30 p.m.—CONGRESS ADJOURNS for LUNCHEON. Delegates will make their own arrangements for Luncheon.

2.30 p.m.—JOINT MEETING WITH THE IRON & STEEL INSTITUTE.

PRESENTATION AND DISCUSSION OF PAPERS Nos. 680, 681, 682, 683, 684, and 674 (For details, see page 478.)

5.30 p.m.—CONGRESS CLOSES.

Saturday, June 17

EXCURSION TO WINDSOR CASTLE and on RIVER THAMES. (*Stewards wear white rosettes.*)

9.20 a.m.—DEPART PADDINGTON RAILWAY STATION by train.

10.00 a.m.—ARRIVE WINDSOR. Transfer to Windsor Castle. Inspection of Castle.

12.00 noon.—DEPART WINDSOR CASTLE.

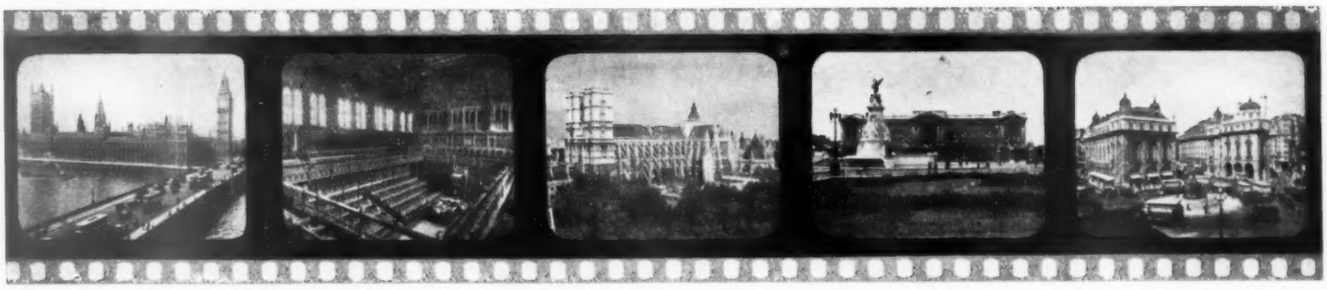
12.15 p.m.—LUNCHEON at the CASTLE HOTEL, Windsor.

2.00 p.m.—DEPART from WINDSOR BRIDGE by steamer for trip on River Thames via Maidenhead and Cookham. TEA will be served on board.

5.00 p.m.—ARRIVE BOURNE END.

5.13 p.m.—DEPART BOURNE END RAILWAY STATION by train.

6.27 p.m.—ARRIVE PADDINGTON STATION, LONDON.



What Has Been Planned for the Ladies

THE Congress organisers must be trebly pleased that such large numbers of lady visitors will be taking part in next week's proceedings. First, the company of the ladies at these gatherings is always welcomed. Secondly, their very presence at many of the social functions will lend a brilliance and grace which will do much to ensure the fullest measure of success. Lastly, the fact that such splendid support has been forthcoming encourages the belief that the efforts of the organisers to provide a really attractive Ladies' Programme (and its planning has been a matter of the greatest concern and elaborate care) have been widely appreciated and hence amply rewarded.

It is peculiarly fitting that the first event on the programme will, by its very nature, allow the ladies to look their best in a delightful setting. The Garden Party to be given by Mr. Barrington Hooper, C.B.E., and Mrs. Hooper at Southward, their home at Harrow, on Sunday afternoon, should be a most pleasant occasion. At no time does an English garden look more lovely than in early June.

Monday—a free day—will provide the visitors with an opportunity to indulge in sightseeing to an extent bounded only by time and inclination. If it is their first stay in London, they are indeed to be envied. As Dr. Johnson said (somewhat weightily): "When a man is tired of London he is tired of life; for there is in London all that life can afford." Many of the principal places of interest are to be covered during the official excursions later in the week, but there is an infinite variety of attractions on every side.

For grandeur and history in stone, the visitor can trace her steps to Buckingham Palace and St. James's Palace, to Westminster Abbey and Wren's great masterpiece, St. Paul's Cathedral; for culture and art, the British Museum in Bloomsbury, the group of museums in Kensington, the Royal Academy, the public and private art galleries; for quiet picturesqueness, the Inner Temple and its hushed courts and gardens just off busy Fleet Street; for shopping, famous thoroughfares like Bond Street, Regent Street and the Ladies' Mile, as that part of Oxford Street stretching from Marble Arch to Tottenham Court Road is called; for colourful pageantry, the Changing of the Guard; for evening entertainment, the choice of innumerable restaurants and theatres. . . . But the list could be extended indefinitely, and if the overseas guests have not already decided upon just what things most appeal to them, we imagine that the English ladies will be able to help them.

Houses of Parliament

The official opening of the Congress in the Ballroom of the Dorchester Hotel at 10 a.m. on Tuesday will be attended by the ladies, and this ceremony they will see performed by the Lord Mayor of London. There is a buffet luncheon at the Dorchester at 1.15 p.m., and while the menfolk are immersed in technical deliberations during the afternoon the ladies will make a conducted tour of the Houses of Parliament, the great Clock Tower of which (rising 300 ft. from the Thames' bank) houses Big Ben—surely the most famous bell in the world. Here, starting from the Public Entrance at 3 p.m., they will see the King's Robing Room, used by Their Majesties on the occasion of opening Parliament; the sumptuously decorated House of Lords with its thrones and quaint Woolsack, and the more sober House of Commons; St. Stephen's Hall, on the site of St. Stephen's Chapel where the Commons met for centuries; and finally Westminster Hall, one of the most historic edifices in the whole of the Kingdom, under whose wonderful 600-year old roof have been enacted some of the most dramatic scenes in English history.

The evening will bring all members of the Congress to Lancaster House, at 10 p.m., for the Reception by His Majesty's Government. The guests will be received by the Rt. Hon. the Lord Runciman, P.C. (Lord President of the Council), and Lady Runciman. Apart from the interest and significance of the event, there is much to be seen, for this fine house, a striking feature of which is the Grand Staircase, contains the London Museum. The exhibits illustrate the history and social and domestic life of the city in all periods, and range from royal coronation robes to the hulk of a Roman galley which had lain buried in Thames mud for hundreds of years.

A choice will already have been made from among the visits arranged for Wednesday morning. Coaches leave Park Street, at the rear of the Dorchester Hotel, at 9.30 a.m. for Cadby Hall, the large premises in Kensington of J. Lyons, where this important catering firm prepares the vast quantities of food for its innumerable cafés and teashops. Alternatively, parties assemble at 10 a.m. either at the Wallace Collection in Hertford House (just off Oxford Street near Marble Arch), where there is a superb collection of paintings, furniture, porcelain, miniatures and armour; or the National Gallery, overlooking Trafalgar Square, which as a representative collection of the various schools of painting is unrivalled; or the Tate Gallery by the river at Millbank, the chief glory of which is the wonderful series of works by Turner.

Buffet luncheon may be taken at the Dorchester, and the ladies will spend the afternoon in quite a different sphere from the morning's surroundings, for a tour of one of our large departmental stores in Kensington—Derry & Toms—will provide an acquaintance with the bustle and colour of this popular shopping district. The party assembles in the Restaurant Lounge of the store at 2.45 p.m., and will be invited to have tea on the roof garden.

The Congress Banquet will be held in the Ballroom of the Dorchester in the evening. It will be preceded, at 7 p.m., by the Reception by Mr. W. B. Lake (President of the Institute of British Foundrymen) and Mrs. Lake and Dr. Guido Vanzetti (President of the International Committee of Foundry Technical Associations) and Signora Vanzetti. The banquet itself will begin at 7.30 p.m., and should present one of the most brilliant scenes of the whole week, whilst dancing will occupy the later hours, continuing until one o'clock in the morning.

A Morning Amid Millinery

On Thursday one party of ladies will leave London by coach, starting from Park Street at 9 a.m., for Luton, where they will be able to see the manufacture of straw hats at Currant & Creak's factory. It is pardonable to assume that the visitors will be as much interested in the finished product as the processes whereby these essential articles of feminine adornment are created. They will then proceed to Whipsnade Zoo, there to lunch with the gentlemen who have been inspecting the Bagshawe works at Dunstable, and the whole party will be free to roam in the spacious and bracing surroundings of the open-air zoo until 4.30 p.m., when the coaches leave the main gates for London.

(*Continued on page* 462.)

1.—Mr. J. HEPWORTH, J.P., M.P. (Chairman of National Committee). President of the Institute, 1938-39. Director, Bradford Piston and Piston Ring Co., Ltd.

2.—Mr. W. B. LAKE, J.P. (Member, National Committee; Chairman, London Committee). President-elect of the Institute. Director, Lake & Elliott, Ltd., Braintree.

3.—Major R. MILES, M.Eng. (National Committee). Vice-President of the Institute. Director, Head Wrightson & Co., Ltd., Thornaby-on-Tees.

4.—Mr. C. BIGG (National Committee). President of the Institute, 1937-38. Director, Qualcast, Ltd., Derby.

5.—Mr. L. W. BOLTON, A.M.I.Mech.E. (National Committee, representing Birmingham). Staff Member of British Cast Iron Research Association.

6.—Mr. JOHN BELL (National Committee, representing Scotland). Director, Albert Smith & Co., Glasgow.

7.—Mr. R. H. BUCKLAND, A.M.I.Mech.E. (National Committee, representing East Midlands). Ley's Malleable Castings Co., Ltd., Derby.

8.—Mr. T. MAKEMSON (all Committees). Secretary of the Institute and of the International Committee of Foundry Technical Associations.

9.—Mr. R. A. JONES (National Committee, representing Lancashire). Director, W. & J. F. Jones, Ltd., Pendlebury.

10.—Mr. T. R. WALKER, M.A. (National Committee, representing Sheffield). Chief Chemist, English Steel Corporation, Sheffield.

11.—Mr. JOHN BOLTON (National Committee). Assistant Secretary of the Institute.

12.—Mr. E. B. ELLIS (National Committee, representing Newcastle).

13.—Mr. C. C. BOOTH, J.P. (London Committee). Director, Booth & Brookes, Ltd., Burnham-on-Crouch.

14.—Mr. BARRINGTON HOOPER, C.B.E. (National and London Committees). Managing Director, "Foundry Trade Journal."

15.—Mr. V. DELPORT (National Committee; Hon. Secretary of London Committee). Director, Penton Publishing Co., Ltd., London.

16.—Mr. V. C. FAULKNER, F.R.S.A. (National and London Committees). President of the Institute, 1926. Editor of the "Foundry Trade Journal."

17.—Mr. H. W. LOCKWOOD (National and London Committees). London Staff, Stewarts and Lloyds, Ltd.

18.—Dr. A. B. EVEREST, Ph.D. (London Committee). Development Officer, Mond Nickel Co., Ltd., London.

19.—G. W. DAGLISH (National Committee). Hon. Secretary of London Branch of the Institute. London Office, Stewarts and Lloyds, Ltd.

20.—Mr. F. A. WILSON (Golf Committee). William Jacks & Co., Ltd., London.

21.—Miss LAKE (London Ladies' Committee).

22.—Mrs. V. DELPORT (London Ladies' Committee).

23.—Mrs. H. W. LOCKWOOD (London Ladies' Committee).

24.—Mrs. A. B. EVEREST (London Ladies' Committee).

Inquiries—Renseignements—Auskunft

FOR the smooth running of the Congress a number of ladies and gentlemen have kindly offered their services as stewards. They will be distinguished by the colour of the rosettes they will wear. Listed below for the various functions are the names of the stewards and the colour of their rosettes.

Garden Party, Sunday (White Rosettes).—Mr. G. R. Webster; Mrs. Everest; Mrs. Delport and Mrs. Kayser.

Registration and Reception, Monday (White Rosettes).—Mr. F. Barrington Hooper; Mr. R. E. Berk; Mr. A. Burn-Callander; Mr. E. A. Chell; Mr. Lennox Holt; Mr. F. L. Hoult; Mr. Charles Monseur and Mr. R. Pipes.

Registration and Technical Sessions, Tuesday (White Rosettes).—Mr. R. E. Berk; Mr. S. C. Booth; Mr. E. A. Carlisle; Mr. V. L. Cashmore; Mr. W. E. Holmes; Mr. B. B. Kent; Mr. A. Logan; Mr. P. D. Pincott, and Mr. C. H. Tanner.

Registration and Technical Sessions, Wednesday.—Mr. H. A. Fox; Mr. C. Monseur, and Mr. W. Thomas.

Ces Messieurs et Dames Parlent Français

MR. A. BURN-CALLANDER (*also Italian*).
MR. V. DELPORT.
MRS. DELPORT.
MR. W. E. DOBSON.
DR. A. B. EVEREST.
MRS. EVEREST.
MR. F. BARRINGTON HOOPER.
MR. B. B. KENT.
MR. LICHFOLD.
MR. C. MONSEUR.

Works Visits on Wednesday

J. & E. Hall, Limited (Orange Rosettes).—Mr. E. A. Chell; Mr. H. W. Lockwood; Mr. E. A. McRae Smith, and Mr. R. Pipes.

Ealing Park Foundry (Red Rosettes).—Dr. A. B. Everest, and Mr. C. H. Kain.

Sterling Manufacturing Company (Light Blue Rosettes).—Mr. A. Burn-Callander; Mr. D. G. Mather, and Mr. W. B. Sallitt.

R. & A. Main (Yellow Rosettes).—Mr. E. A. Carlisle; Mr. F. H. Hoult; Mr. Lichfold, and Mr. W. Thomas.

Gillett & Johnston (Green Rosettes).—Mr. S. C. Booth, and Mr. W. E. Holmes.

Glacier Metal Company (Dark Blue Rosettes).—Dr. W. D. Jones and Mr. A. Logan.

The Banquet, Wednesday (White Rosettes).—Mr. V. Delport; Dr. A. B. Everest; Mr. A. C. Turner, and Mr. B. B. Kent.

Works Visits on Thursday

Belling & Company (Yellow Rosettes).—Mr. Lichfold, Mr. R. Pipes and Mr. W. Thomas.

Ipswich, visiting the works of Crane, Limited, and E. R. & F. Turner (Light Blue Rosettes).—Mr. A. E. Carlisle, Mr. R. E. Berk and Mr. C. H. Tanner.

Bagshawe & Company, Dunstable (Orange Rosettes).—Mr. F. Barrington Hooper and Mr. B. B. Kent.

Ford Motor Company, Limited (Pink Rosettes).—Mr. S. C. Booth, Mr. H. W. Lockwood and Mr. P. D. Pincott.

National Physical Laboratory (Red Rosettes).—Mr. V. L. Cashmore and Mr. F. Cree.

Mr. Lake's Reception on Thursday (White Rosettes).—Mr. John Bolton, Mr. T. Makemson, Mr. R. Pipes and Mr. H. C. Turner.

Technical Sessions on Friday (White Rosettes).—Morning: Mr. A. Burn-Callander, Mr. A. E. Carlisle, Mr. F. Cree and Mr. G. R. Webster. Afternoon: Mr. E. A. Chell, Mr. C. H. Kain and Mr. P. D. Pincott.

Excursion to Windsor on Saturday (White Rosettes).—Mr. J. Bolton, Dr. and Mrs. Everest and Mr. T. Makemson.

In addition to the above, the following have also volunteered to help with the registration and at technical sessions:—Mr. W. E. Dobson, Mr. G. E. France, Mr. J. H. Smeeton and Mrs. Trevor Owen.

The Ladies' Programme

Garden Party at Harrow (White Rosettes).—Mrs. Delport, Mrs. Everest, Mrs. Kayser and Miss Lake.

Tour of the Houses of Parliament (Red Rosettes).—Mrs. Delport, Mrs. Everest, Mrs. and Miss Smeeton.

Cadby Hall (Dark Blue Rosettes).—Mrs. Kayser, Mrs. Owen and Mrs. Pipes.

Wallace Collection (Pink Rosette).—Miss Lake.

Diese Damen und Herren sprechen Deutsch

MR. R. E. BERK.
MR. S. C. BOOTH.
MR. F. BARRINGTON HOOPER.
MR. C. MONSEUR.
MRS. T. T. OWEN (*also the Scandinavian languages*).
MRS. J. A. SMEETON.
MISS SMEETON.
MR. C. H. TANNER.
MR. G. R. WEBSTER.

National Gallery (Green Rosette).—Mrs. Everest.

Tate Gallery (Yellow Rosette).—Mrs. Delport.

Derry & Toms' Departmental Stores (Pink Rosettes).—Miss Lake and Mrs. Owen.

Currant & Creak's Hat Factory (Dark Blue Rosette).—Mr. G. R. Webster.

The Barbers' Hall.—Mrs. Delport, Mrs. Everest, Mrs. and Miss Smeeton.

Tour of London (Red Rosette).—Mrs. Delport.

Hampton Court (Green Rosette).—Mrs. Kayser.

What Has Been Planned for the Ladies

(*Continued from page* 459.)

Those who have elected to have the morning free will spend a most fascinating afternoon in the Hall of the Worshipful Company of Barbers (coaches leave Park Street at 2.30 p.m.). This Company is one of the 78 livery companies of the City of London—so called because in by-gone days their members wore a distinctive dress or "livery"—and recalls the time when the barbers performed the duties of surgeons. In view of the fact that this visit is an unusual privilege, the following notes about the Hall may be of general interest.

Hall of the Barbers' Company

It was erected in 1634 to designs of Inigo Jones, and is a beautiful specimen of that celebrated architect's work. It was one of the few halls of the City Guilds to escape destruction by the Great Fire in 1666. Historic though the building itself is, the treasures it houses form a link with the pomp and pageantry of earlier days. The barbers existed as a trade guild as far back as in the thirteenth century, and one ancient document of 1388 sets out its constitution at that time, when "decayed brethren had 10½d. per week if their poverty be not come about by their own folly." The first Royal Charter—still preserved—was granted in 1462 by Edward IV at a cost of £10, yet a second by Henry VII (1499) cost only 20s. In 1540 an Act of Parliament incorporated the Barbers' Company and the smaller, once-hostile Surgeons' Guild, and this union continued for 200 years until dissolved by Parliament in 1745. The Act of Incorporation was commemorated by Hans Holbein painting the great picture of Henry VIII which is the Company's chief treasure (Samuel Pepys, the diarist, itched to buy it) and the finest known portrait of Bluff King Hal. That monarch presented to the Company the priceless Royal Grace Cup, a silver-gilt tazza-shaped cup of 26 ozs. This fine piece of plate, once stolen (the four thieves who committed the crime were all caught and hanged), and once sold to provide money for the Civil Wars, happily each time was recovered without damage. Curious treatment was received from Charles II, for he presented a wonderful cup of early hammered silverwork—the Royal Oak Cup—yet later illegally compelled surrender of all the Company's numerous Charters. These were subsequently restored by James II, just before his flight from the country in 1688, as part of a last bid to regain the goodwill of the citizens. Among the paintings in the Hall are notable portraits by Vandyke, Sir Joshua Reynolds and Lely, as well as Holbein's masterpiece.

In the evening there will be a reception at the Dorchester at 8.30 p.m., by invitation of Mr. and Mrs. Lake, and dancing will again be provided.

A full day of sightseeing will occupy Friday. "From the top of a bus" was Gladstone's advice as the best way to see London, but the modern motor-coach is an even better means. Starting at 9.45 a.m. from headquarters, the route runs easterly via Piccadilly Circus and Trafalgar Square to St. Paul's, and then on to London Bridge and Tower Bridge to the Tower of London, whose grey walls have been the mute witnesses of so many grim episodes in the lives of the great. The Wakefield Tower is to-day the repository of the Crown Jewels. The return journey will be made through the City, past the civic palace of the Guildhall, along the Victoria Embankment which skirts the river, to Pall Mall and eventually back to the starting point.

Hampton Court and Kew Gardens will be visited in the afternoon (coaches leave at 2.30 p.m.). A thousand compartments are contained in the stately and beautiful Palace at Hampton Court, its red brick mellowed by time. The State Rooms are magnificent, with a fine collection of paintings and tapestries, while the gardens make a picture of loveliness. They contain the famous Great Vine, planted in 1786, and the intricate Maze. On a much larger scale are the Royal Botanic Gardens at Kew. They cover 300 acres, and every species of tree, shrub and flower are to be found therein, many of them in bloom. The large Palm House and the smaller houses containing orchids and other tropical flowers should be seen if time permits. Tea will be served in the Gardens. The evening will be left free.

The last day of the Congress is devoted to the whole-day excursion to Windsor Castle and a trip on the Thames, both the ladies and gentlemen taking part. We can imagine no more delightful an outing for concluding the Congress.

These Foundries will be Visited During the Congress

The average visitor to London is completely ignorant of the fact that it is the centre for several hundreds of foundries. Those to be visited next week are entirely representative, except in so far as light alloys and heavy non-ferrous metals are concerned. In these cases the exigiencies of rearmament are the sole causes for inability to receive visitors. Ten years ago, no mechanised foundries operated in the Metropolitan area, today there are at least a dozen. Moreover, it is truthful to state that there has been a widespread re-equipment of the entire industry. We acknowledge with gratitude the help accorded by the officials of the works described below.

Bagshawe & Company, Limited, Dunstable

THE Dunstable Works of Bagshawe & Company, Limited, are situated a little over thirty miles north of London. They were built in 1906 with a view to manufacturing in this country mechanical chains which previously had largely been imported from abroad. The venture was entirely successful, and now the firm ranks as one of the leading chain manufacturers in the country.

Closely connected with the use of chains was the manufacture of appliances for the mechanical handling of materials, commonly known as conveyors and elevators, and then but slightly developed. In recent years the need for these apparatuses has become more and more apparent to industry, and their adoption is largely responsible for the cheap prices at which many commodities are now produced. The name of Bagshawe is known all over the country as manufacturers of these appliances, and the firm has been responsible for the erection of many important installations.

In addition to the manufacture of conveyors, elevators and chains, the firm also specialises in the production of high-grade malleable iron castings and small repetition grey-iron castings.

The main foundry, which is used for the manufacture of castings in malleable and grey iron, comprises a moulding shop, core shop, melting plant, fettling and straightening departments, and annealing shop. There is also a heat-treatment department and chemical and physical laboratories.

The moulding shop (see Fig. 1) consists of three main bays, each about 120 ft. in length and 30 ft. wide. The first of these is used principally for the production of grey-iron sprocket wheels for use in connection with the chains, miscellaneous small castings for use in the elevating and conveying department, and small repetition castings. This grey-iron bay is fed by a small cupola melting 2 to 3 tons per hr.

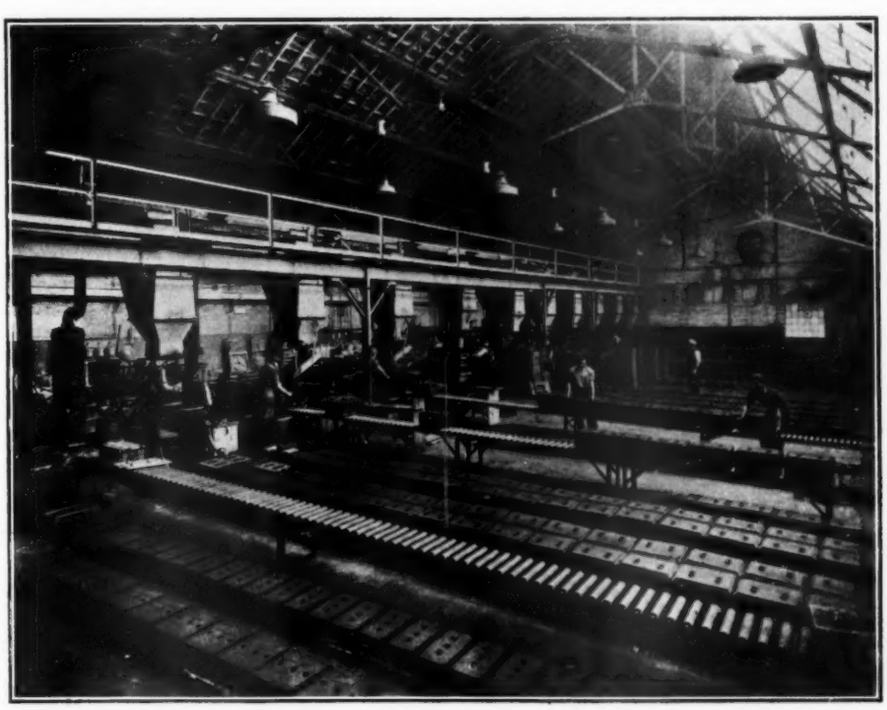
With the exception of a certain amount of white-iron castings for crushing machinery, the remaining two bays are devoted entirely to small whiteheart malleable-iron castings. The greater part of the work is made in snap flasks, although, when the occasion demands it, rolled steel moulding boxes are used. The middle bay is reserved chiefly for malleable-iron castings used in the motor-car and kindred trades. It will be seen from Fig. 1 that this is equipped with a mechanical sand-handling plant and that each moulding machine is fed from a sand bunker.

The moulding machines consist of the pneumatic jolt-squeeze type for snap-flask work, together with jar-ram and hydro-pneumatic turnover machines for steel box work. Sand used in this bay is prepared in the most modern type of sand-preparing and conditioning plant. This plant (Fig. 2) was made in the company's own works, for it specialises in the manufacture of such plants and has installed some of the largest in the British Isles. The used sand, after being mixed with the requisite amounts of new sand and coal-dust, is conveyed by an elevator into a rotary screen, where any hard lumps or large pieces of core sand, scrap iron and the like are discharged. The sand then passes along a conveyor belt and over a magnetic pulley, where the final traces of iron shot, sprigs, and other foreign matter are removed. After having been milled, the sand is again elevated and then aerated in a disintegrator prior to passing into the main belt conveyor which feeds the bunkers.

The remaining moulding bay is used for the numerous types of links which are employed in the manufacture of chains for driving purposes and for the extensive range of conveyors and elevators made by the firm. Some idea of the multiplicity of these can be gathered from a glance in the pattern stores, where very large numbers of patterns for the various types of links and their attachments as well as for the sprocket wheels are readily accessible for use in the foundry. There is an efficient patternshop adjoining the foundries, where new patterns are continually being made and through which all patterns pass for inspection and checking before being released for production purposes.

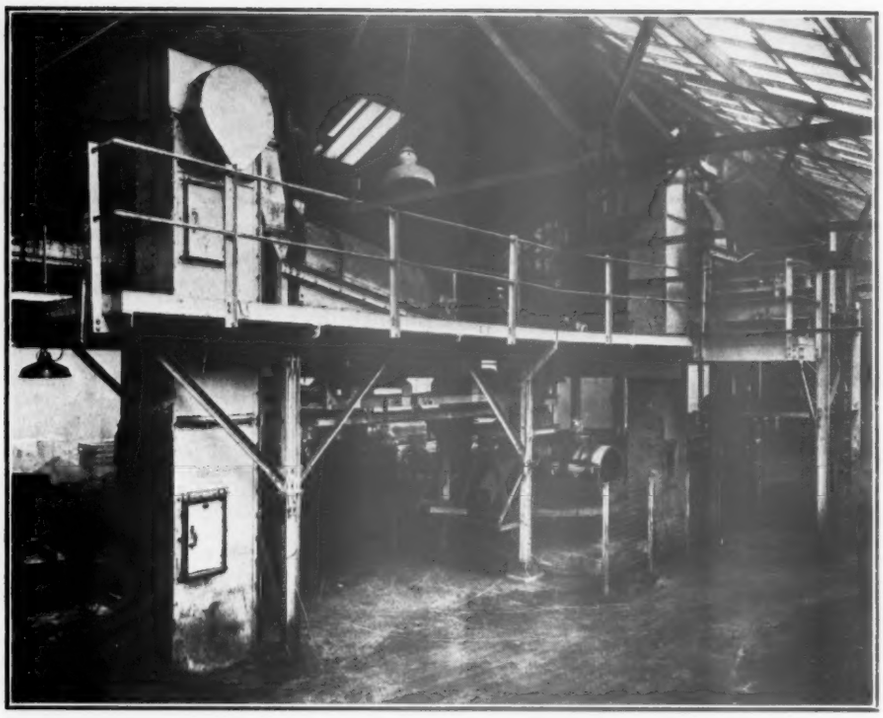
The malleable-iron bays are served by a 7 tons per hour cupola. Tapping temperatures in the region of 1,500 deg. C. are maintained, as extreme fluidity is required to run some of the intricate sprays of small chain links. A rotary furnace has been installed in addition for experimental use in the production of blackheart malleable iron in which the firm is also interested.

Female labour is employed in the core shop (Fig. 3) and a large variety of small semi-repetition oil-sand cores make up the greater part of the work. The cores are dried in a continuous vertical oven at a temperature of 200 deg.



(Courtesy Bagshawe & Co.)

FIG. 1.—VIEW IN THE MAIN FOUNDRY OF BAGSHAWE & COMPANY.



(*Courtesy Bagshawe & Co.*)

FIG. 2.—SAND PREPARING AND CONDITIONING PLANT AT BAGSHAWE'S.

C. This oven was also made in the company's shops and has been furnished in various sizes to other foundries. A large proportion of the cores are made by means of the core blower. This type of machine has proved very successful indeed where the numbers of cores required are fairly large. Considerable improvements are now being made in the foundry and more are under consideration.

The grinding shop has twelve double-ended machines fed by gravity roller conveyors down which work is passed on trays after inspection. A good deal of experimental work has been carried out on the question of high-speed grinding, and in the near future it is expected that this will replace the present system.

The annealing department is comprised of four ovens of the batch type, each with a capacity of between 16 and 20 tons. The castings are packed in white iron boxes in the usual hematite ore mixture and are annealed under a controlled cycle for 100 to 120 hours. The ovens are fired by pulverised fuel. The handling of the small coal is accomplished by one of the firm's own mechanical handling plants designed specially for the purpose.

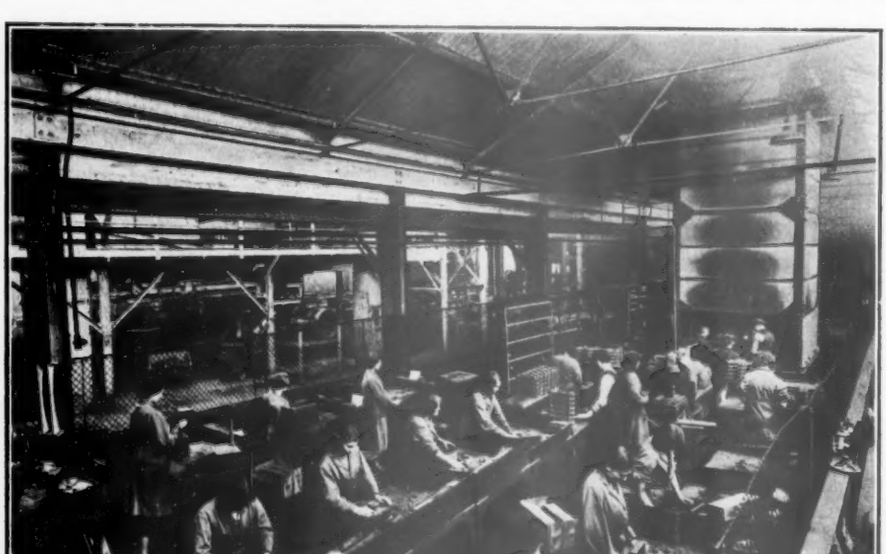
All castings after having been annealed are barrelled to remove any traces of adhering ore. Straightening and setting is done where necessary, and the castings are then shot-blasted and inspected before despatch.

All iron mixtures and sand control are supervised by the laboratory, in which routine analyses of the daily mixtures are carried out. In addition all incoming materials are checked to specification.

The physical testing section is equipped with a hydraulic testing machine, a Brinell hardness machine, microscopical equipment, and there are facilities for the routine testing of sand mixtures.

To give some idea of the physical properties of the whiteheart malleable iron produced at Dunstable Works, the following figures are given. These represent the average test results on fifty consecutive ovens:—Tensile strength, 24.70 tons per sq. in.; yield point, 17.83 tons per sq. in.; elongation on 2 in., 8.86 per cent.

As it does not come within the scope of these notes, which are confined to the foundry activities, no mention is made of the remaining sections of Bagshawe & Company's works—the machine shops, chain-assembling and testing departments, erecting shops, and so on. These are grouped in a different set of buildings from the foundry section, and are under independent supervision.



(*Courtesy Bagshawe & Co.*)

FIG. 3.—CORE SHOP EMPLOYING FEMALE LABOUR, AT BAGSHAWE & COMPANY.

J. & E. Hall, Limited, Dartford

AS the works of this company were described so recently in our pages as April 20, we are confining these notes to the more salient features of the plant. There are two quite separate ironfoundries, one for the production of heavy castings and the other for light and medium weight components. The heavy ironfoundry is housed in a building 318 ft. long by 70 ft. wide and 23 ft. high to the crane track. It is spanned by three electric overhead travelling cranes of 30, 15 and 10 tons lifting capacity. There are also a number of jib cranes, one of which, situated in a corner, is retained as being of historical interest. It was built in 1878. The light iron foundry is a low shop divided into five bays. The handling of the metal is effected by five floor-operated overhead travelling cranes. Three have a lifting capacity of 3 tons, one of 4 tons, whilst the fifth handles weights up to 2 tons.

As the Perlit system is practised, visitors should note the repercussions on the mould drying plant and core production. Other noteworthy features are the methods of handling the raw materials to the cupola, the actual cupolas themselves, the rigid metallurgical control and the very high quality of castings made. The shot-blast plants and general cleaning arrangements, too, are interesting, as the cores are more difficult to remove owing to the use of the Perlit system.

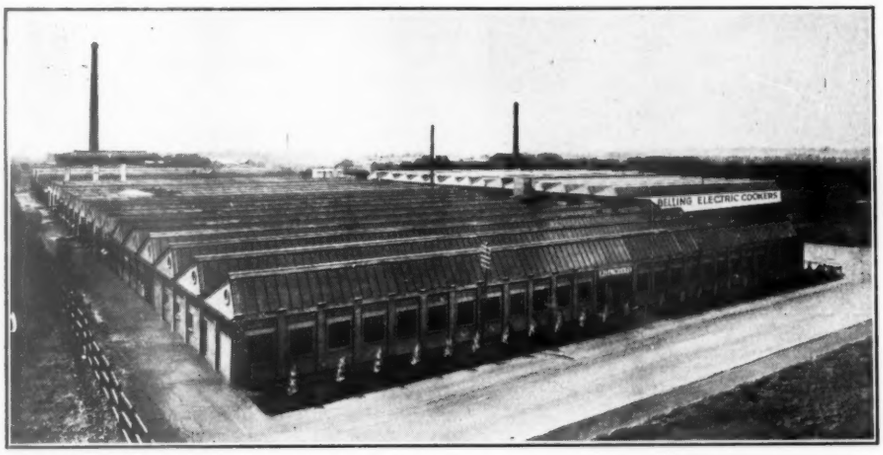
The internal handling arrangements in the light iron foundry will attract the attention of the visitors, whilst the moulding machinery used is of a varied character to fit in with the type of production—refrigerator machinery parts. The brass foundry is a well-conducted department, housed in a separate building. Where this concern excels, however, is in the patternshops, where special conditions have operated to make it rank amongst the very best in the country.

These special conditions relate to the fact that the firm manufactures escalators, lifts and cabinets for ships, and it is because of the need for woodworking machinery for these jobs, that it has been possible to create an especially efficient woodworking department.

Belling & Company, Limited, Enfield

THE Enfield works of Belling & Company, Limited, is amongst the largest in the world devoted exclusively to the production of electric fires and cookers and also domestic irons. Established over a quarter of a century ago, the company were pioneers in the development of the electric fire.

The site of the present works, approximately ten acres, was acquired about 15 years ago, and the major portion of this area is now under roof. It would be wholly impossible to do justice to the works in general, in the space at our disposal, and we must therefore confine ourselves to a brief description of the foundry.



GENERAL VIEW OF BELLING & COMPANY'S WORKS AT ENFIELD.

The foundry is housed in a building with a floor area of 30,000 sq. ft. The floor is laid off into moulding alleys from either side of a central aisle; each alley takes a double row of boxes, and side rails are provided against which to rest the boxes when not in service.

The raw material is stored in compartment bins immediately at the rear of the cupola. For serving the charging platform there is a fleet of twenty barrows, the loads in which are weighed at ground level and then raised to the charging platform by an electric hoist. After tipping, the barrows are wheeled across the cupola front and lowered to the foundry floor by a second hoist. The provision of a second hoist is somewhat unusual, but it is certainly advantageous, permitting a steady flow of material free from congestion, and, at the same time, adequate service is obtained with a much smaller charging platform than would be possible otherwise.

The cupola is of 8 tons capacity, and is a modified form of the Poumay type. It is blown by a Keith Blackman fan delivering, at a pressure of 1 oz., approximately 80,000 cub. ft. per hour. The metal is tapped into ladles of 5-cwt. capacity, for the preparation of which a special department has been organised.

No attempt is made at mechanisation, and indeed, dealing with upwards of 700 different patterns of widely varying sizes and weights, it is doubtful whether any form of mechanisation would be an economic proposition, whilst very definitely it could not enhance the quality of the production. The castings made are of uniformly good quality, with a fine grain and excellent surface—features which are first essentials for the subsequent process of vitreous enamelling.

Hand moulding is, however, supplemented to some extent by the use of seven snap-flask machines. Men working on these machines are consistently making 100 moulds per day. The true measurement of the efficiency is, however, the number of good castings per day for which the machine man is responsible, and records of one machine taken over a period of weeks show an average of 98 per cent. good castings.

Castings are examined before leaving the foundry for the fettling shop. Castings must be truly flat and entirely free from surface blemishes, and no filling of any description is permitted. The fettling shop contains a Tilghman's shot-blast chamber and the usual equipment.

Sand preparation is carried out in an August's plant of standard design, and is barrowed into the foundry by the moulders. The metal ladles are sand-lined and are then dried upon a brazier which was specially designed for the particular duty.

The patternshop houses the usual complement of woodworking machines. Patterns are made in strickled plaster and wood, and metal master and plate patterns are also made in this shop.

Crane Limited, Ipswich

IPSWICH, the industrial centre of East Anglia, possesses exceptional facilities for the efficient operation of large manufacturing concerns, not the least important of those facilities being its port, deep-water quays and well-equipped wharfs. Whilst these were no doubt the main factors which influenced those responsible for the selection of Ipswich as the site of the Nacton Works, the available facilities for recreation were a further determining factor, whilst the family of the founder of the American firm—Crane Company—were associated with Ipswich, Mass., U.S.A.

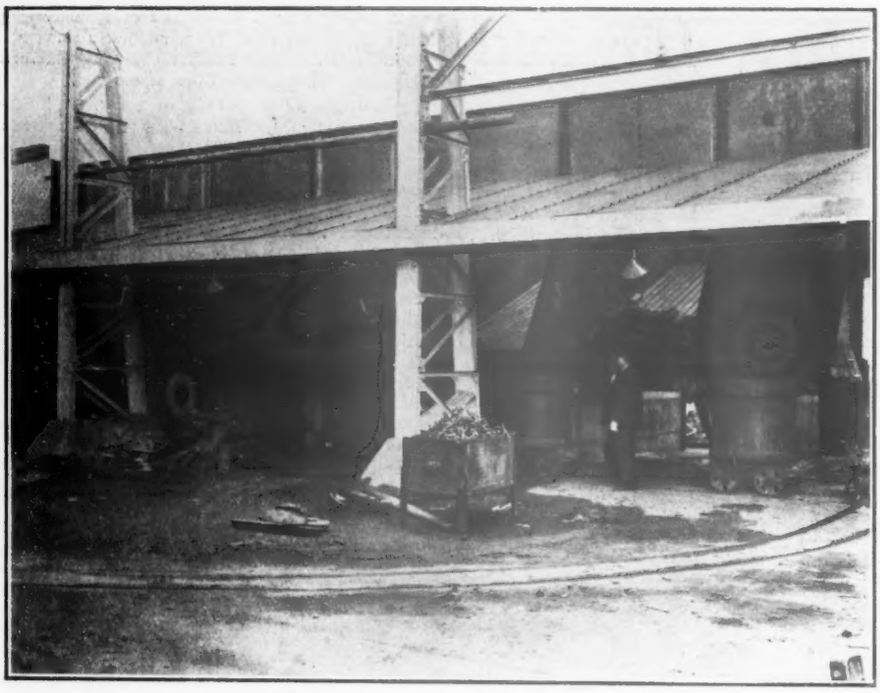
The Nacton works are amongst the most up-to-date of their kind in the kingdom, whilst they claim to have the largest output of malleable iron fittings. Malleable iron fittings are, in fact, the essential speciality of the company, but at the same time they are large manufacturers of radiators, boilers, etc., whilst they also manufacture gunmetal and cast-iron valves.

To describe the works as a whole would require considerably more space than is available in this issue, and further, as the interests of the visitors will lie mainly in the foundries, it is proposed in this article to confine subject matter to a brief description of the foundries.

There are three foundries—the malleable, the grey iron and the non-ferrous. The two first-named are in tandem and covered by one roof, but in other respects they are entirely independent and self-contained, and completely, but rationally, mechanised (the term "rationally" is used to differentiate between economic and over mechanisation).

By a reduction of physical labour, it is reasonable to anticipate an increase of output per man and it is usually a better class of production. Such advantages, however, may be wholly nega-

VIEW IN THE MALLEABLE FOUNDRY OF CRANE, LIMITED.



STORAGE BINS SHOWING CHARGING BUCKETS AT CRANE, LIMITED.

tived by capital and maintenance costs. In a word there is no economy in putting down a plant which dispenses with a labourer but requires the services of a fitter. A system of mechanisation to be sound, as indeed must every mechanical device, must be simple. Extreme simplicity is the keynote of the mechanisation of the Crane Foundries; labour-saving has been effected without the introduction of mechanical complications.

The stocking ground extends for the full length of both foundries, the total length being 620 ft., with a gantry carrying a 5-ton Morris and a 2½-ton Haywood crane, each arranged for carrying a magnet when necessary. The railway track runs through the centre of the stocking ground. Stocks for the malleable and grey iron foundries are kept independent. Bulk stocks are stored on the side of the track distant from the foundry. To meet foundry requirements the material is discharged into steel bins with sloping bottoms which are self-discharging; above these bins is a second series of hoppers for the storage of washed "fines" for service as pulverised fuel.

The Malleable Foundry

Metal is brought down in a cupola of 6 tons per hour capacity, of the balanced blast type. It is blown by a motor-driven Keith Blackman fan. A looped track connects the bins with the cupola hoist. The charge is delivered from the bins into bottom-discharging buckets which are carried on bogie trucks, and pass over an Avery dial weigher to the furnace hoist, by which they are raised and discharged direct into the cupola. The empty buckets return along the track to the bins for a further charge, a very simple and very smooth working arrangement.

The cupola is tapped into a 1,000-lb. teapot ladle to feed the 200-lb. ladles which travel on a mono-rail serving the whole of the casting floor.

The whole of the melting operations are in the care of a metallurgist, who is constantly in charge throughout the working day, and test-bars are taken every quarter of an hour.

Moulding Plant

The moulding plant comprises air press machines which are served by roundabouts. The roundabout consists of a circular table which is pivotally mounted. No power is employed; as the man places the mould upon the table, he gives the necessary movement with his thigh, and one might say the placing of the mould and the movement of the table are simultaneous. The mould is thus moved round to the casting point and thence to the knock-out.

The moulds are knocked out on to an apron conveyor situated at ground level, which delivers casting and sand and discharges on to a jolt bar screen. The effect is remarkably good, the castings and sand are cooled considerably, the latter being aerated to some extent.

From the bar screen the sand is elevated to the reconditioning plant and thence discharged to a short conveyor. This feeds on to a belt conveyor placed at right angles, and which is furnished with a series of ploughs for diverting the sand into the sand hoppers situate above each of the moulding machines.

Before leaving the foundry for the fettling shop, the hard castings are subject to a rigid inspection. The main equipment in the fettling shop consists of six tumbling barrels and a battery of double-head grinders.

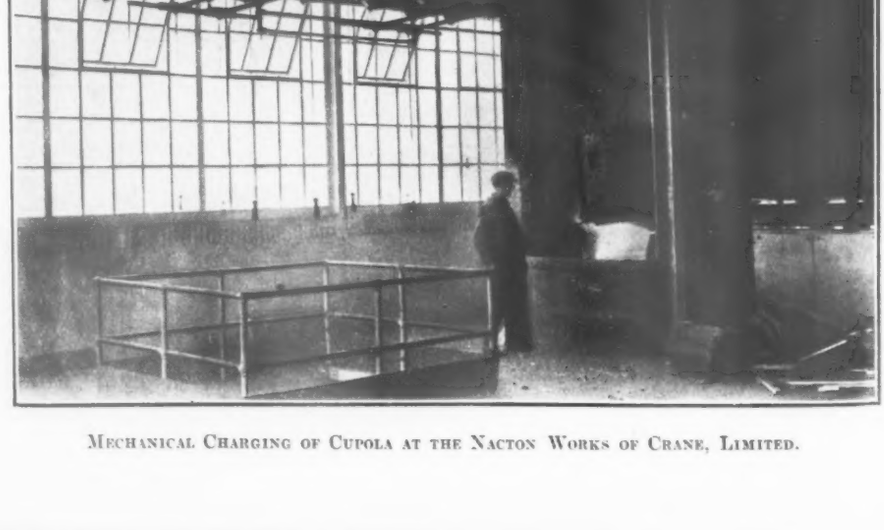
At this stage of manufacture the production is, of course, a white iron carrying a high percentage of combined carbon, and is of a brittle nature. The special composition of the metal, however, is meticulously controlled to conversion into a homogeneous malleable iron by the annealing process. After fettling, the castings are again carefully inspected before packing into the annealing pots.

Annealing Plant

This consists of eight ovens, which are fired with pulverised fuel on the Alfred Herbert Atritor system. Reference has previously been made to the washed "fines," which, of course, have an appreciable moisture content. This is delivered to the pulverising plant in numbered hopper wagons, the contents of which are taken in rotation so that, when the coal is fed to the pulverising unit, the moisture content is no greater than can be taken care of in the mill, the air for which is preheated.

The annealing pots are mounted in tiers of four on iron stools, and each oven takes 40 such tiers. The complete annealing cycle occupies approximately seven days, during which time constant control of the temperature of each individual oven is maintained by automatic recording pyrometers.

After annealing, the castings are again examined; samples are also taken from every pot and subjected to a severe test of malleability. Though it might well be thought that the process of straightening, *i.e.*, correcting the distortion which takes place during annealing, was a severe enough test in itself, such straightening is, of course, necessary before machining operations, but it is certainly stringent, and would impose greater stresses upon the part than the most severe service conditions.



MECHANICAL CHARGING OF CUPOLA AT THE NACTON WORKS OF CRANE, LIMITED.

Grey Iron Foundry

The melting plant consists of two cupolas of 12 tons and 4½ tons capacity, respectively. One of the cupolas is on a steel-mix given the name of Ferro-Steel, which is used for boilers, valves, etc. Work in this foundry is strictly sectionalised, the radiator and boiler founding being kept entirely separate.

In the radiator section there are ten machines. The moulders work in pairs, each on a half-mould, the moulds being assembled on a plate conveyor, somewhat oval in shape; this form of conveyor is employed to provide the necessary time lag for cooling between casting and knocking-out. The knock-out and the sand plant are similar to that of the malleable foundry, but include two 10-ft. Ronceray mills with storage hopper and distributor. The boiler foundry includes a number of jolt-ram Pneulec-Hermann machines and also a turnover; a roundabout is also in service.

The fettling shop contains the usual machines, and in addition, an exceptionally large table type of Wheelabrator built by Tilghman's.

Core Shops

All cores are hand-made. The main core shop serves both the malleable and grey iron foundries, though an imaginary division keeps the two departments distinct. There are three four-chamber and one three-chamber core stoves, which are oil fired. The output of this shop is about 10,000 shells per day, with from four to 24 cores on a shell. Sand is stored in an annex to the main building, and is dried in a rotary dryer before delivery to one of the two mills. Cores for the boiler foundry are made in a separate shop, where two large ovens are in service.

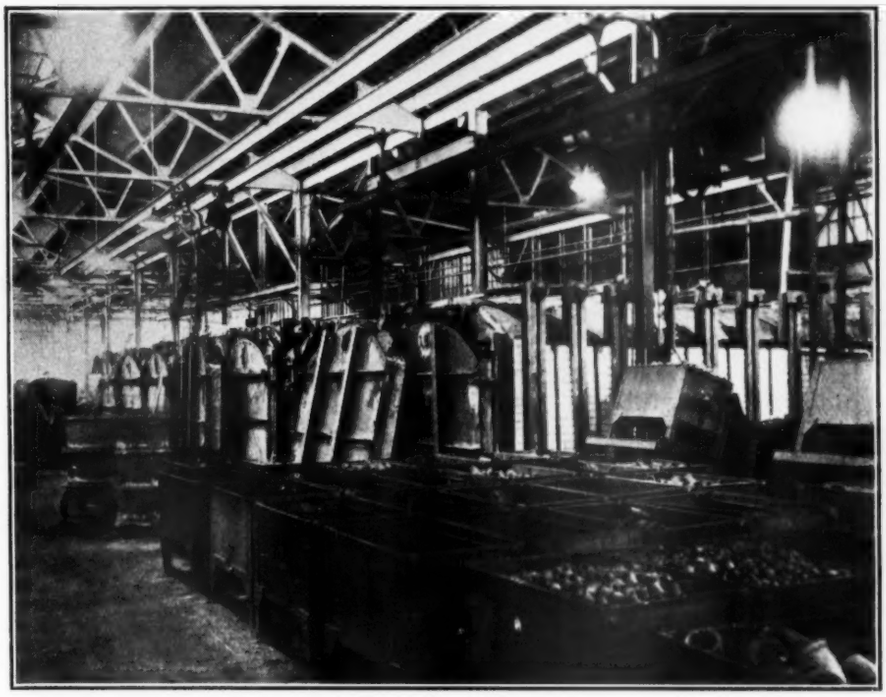
Non-Ferrous Foundry

The melting plant consists of five 440-lb. and one 300-lb. coke-fired tilting furnaces. A metallurgist is in charge of this foundry throughout the working day, and it is worth recording that the scrap is down to 2 per cent.

Whilst a fully illustrated description of the laboratories was published in THE FOUNDRY TRADE JOURNAL on February 10, 1938, an article on the foundries would be incomplete without brief reference. During recent years there has certainly arisen a more generous appreciation of the laboratory, though even to-day one too often finds it situated where room can be found, regardless of the suitability of the site, whilst the metallurgist is given no more apparatus than he cannot do without. Too often also he is fully occupied doing routine work, with neither facilities nor time for research.

The laboratories of the Nacton Works are an outstanding example of all that is best. They occupy a building erected for their accommodation entirely separate from the shops. Separate departments are allocated for physical research, chemical work, mechanical testing, heat-treatment, sand testing, routine analysis, etc. The equipment throughout is representative of the most advanced practice.

The company are at present engaged upon the construction of air raid shelters to accommodate the whole of their employees. The shelters, a number of which are already finished, except as to minor details, are 29 ft. by 7 ft., and provide accommodation for 50 men. They are constructed in reinforced concrete, with arched roof and concrete floor, drained, electrically-lighted, with provision for emergency lighting. In all, some 16 of these shelters are to be built. A number of them are placed tandem to the foundry building, and when this is extended entrance will be possible from the foundry floor.



GENERAL VIEW OF ANNEALING OVENS AT THE WORKS OF CRANE, LIMITED.

Ealing Park Foundry Company, Limited, South Ealing

IN 1918 Mr. H. Shannon established himself at Ealing Park for the production of high-class iron castings. He was alive to the fact that only a comparatively small percentage of the high-grade castings consumed in the London area was produced locally. The explanation was that the castings which up to that time had been produced in the London foundries were inferior to those obtainable from the Midlands. Mr. Shannon very rightly formed the opinion that there was a good opening for a foundry turning out a high-grade production.

The site selected for the works was a very convenient one, with offices fronting on to the

VIEW IN THE MAIN FOUNDRY OF THE EALING PARK WORKS.

The Heavy Section of the Ealing Park Foundry.

Junction Road. It is within six miles of Charing Cross Station. The opposite ends of the site are bounded by the Carlyle and Darwen Roads respectively; gateway entrances were made on to both, an arrangement which permits of the whole of the raw material being brought in at the one end and the finished castings despatched from the other.

The foundry was designed and laid out by Mr. Robert Shaw, upon the then most modern lines alike on the ferrous and non-ferrous sides.

The products of the Ealing Park Foundry from the very outset found a ready local market, and in the short space of two years it became necessary to provide for the expansion in business. In order to do this, as also to provide for the manufacture of castings for Gwynne's Engineering Company, Limited, the business was converted into a private company in 1920, under the chairmanship of Mr. Nevil G. Gwynne, with Mr. Shannon as managing director. The business passed into the hands of the present management in 1932, with Mr. H. Shannon and Mr. R. B. Templeton as directors.

Under the new management the Meehanite process was operated, and the whole of the output of the works is the product of this system. General castings are now made up to 2½ tons in weight. In the meantime the main specialities are castings for dies, machine-tool parts, cylinder liners, compressor parts, crankshafts, camshafts, and all types of pressure castings.

Obviously, to meet the new conditions of working, a considerable amount of reconstruction work was necessary, and at the same time extensions were made to the main foundry.

The stocking ground is served by a series of bins into which the materials, brought in by lorries, are discharged, or loaded direct into the hopper truck, as the case may be. The loaded truck, after passing over a dial weighbridge, is tipped into the skip on the furnace hoist; this hoist is of 15 cwts. and is electrically operated.

There are two cupolas by the Constructional Engineering Company, of Birmingham, each of 3 tons per hour, which are worked alternately. Blast is supplied by a Keith Blackman high-pressure fan, which is driven by a 20-h.p. motor. Pressure and volume meters are in service. The charging platform, which is common to both cupolas, is 36 ft. by 40 ft., thus making liberal provision for the storage of coke and alloys.

The cupolas are hand-charged, a method which, of course, gives a more even distribution of the burden than is possible with a mechanical charger, and in view of the high steel content it will be readily appreciated that even distribution is a factor of importance. The metal is tapped into 600-lb. ladles.

The layout provides for strict sectionalisation. The main foundry, measuring 180 ft. by 40 ft., is served by two overhead cranes of 5 tons and 3 tons capacity respectively. It is laid off for heavy hand moulding, whilst a section, consisting of two bays, each 36 ft. by 60 ft., is devoted to light hand moulding, and a further portion allocated to machine moulding is carried out in a bay 34 ft. by 100 ft.

Facing sand is prepared in a pan mill housed in an annex to the foundry and is barrowed by the moulders. The machine moulds are knocked out on the floor. The sand is elevated to pass over a magnetic separator before entering the Royer machine; after passing through the mill it is discharged into a skip, which is hoisted on to a mono-rail track above the sand hoppers serving the moulding machines, and is bottom-discharged into any particular hopper. This arrangement, which, of course, takes the place of the more usual system of belt conveyors, is alike efficient, simple and economic, and works particularly smoothly. All the operations are performed electrically through push-button control from floor level.

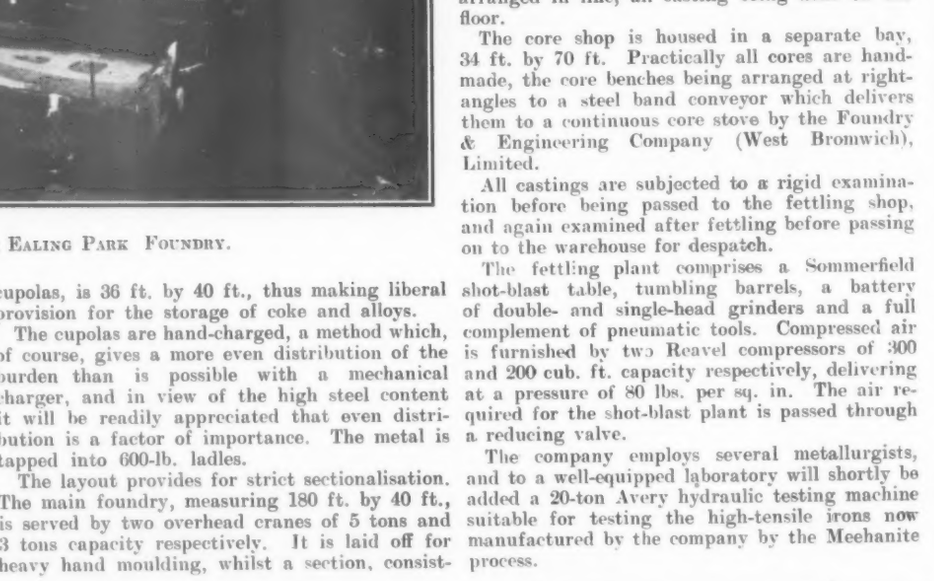
The drying stoves for the foundry are coke-fired and arranged for bogie charging. There are sixteen jolt-ramming machines, which are arranged in line, all casting being done on the floor.

The core shop is housed in a separate bay, 34 ft. by 70 ft. Practically all cores are hand-made, the core benches being arranged at right-angles to a steel band conveyor which delivers them to a continuous core stove by the Foundry & Engineering Company (West Bromwich), Limited.

All castings are subjected to a rigid examination before being passed to the fettling shop, and again examined after fettling before passing on to the warehouse for despatch.

The fettling plant comprises a Sommerfield shot-blast table, tumbling barrels, a battery of double- and single-head grinders and a full complement of pneumatic tools. Compressed air is furnished by two Reavel compressors of 300 and 200 cub. ft. capacity respectively, delivering at a pressure of 80 lbs. per sq. in. The air required for the shot-blast plant is passed through a reducing valve.

The company employs several metallurgists, and to a well-equipped laboratory will shortly be added a 20-ton Avery hydraulic testing machine suitable for testing the high-tensile irons now manufactured by the company by the Meehanite process.



The Machine Moulding Bay in the Ealing Park Foundry.

Ford Motor Company, Limited, Dagenham

BECAUSE of considerations of space and the fact that from time to time full-length descriptions of the Ford Foundry at Dagenham have appeared in our columns, it is proposed on this occasion to deal only with three phases of its more recent activities—the manufacture of silicon copper alloys, quick-anneal malleable, and innovations in the handling of raw materials for the cupola.

Copper Silicon Alloy

Though three or four grades of this alloy are manufactured, it is proposed to confine remarks to a consideration of the material used for brake-drums. Fundamentally it is a border-line alloy, claimed with equal justice to enter the domains of iron and steel founding. Its composition is of the order of C, 1.4 to 1.6; Si, 0.85 to 1.1; Mn, 0.7 to 0.8; S, 0.06 (max.); P, 0.10 (max.) and Cu, 1.5 to 2.0 per cent. The material is melted in a 3-phase, 3-electrode acid-lined electric furnace of 3 tons capacity carrying a removable roof for top charging from a drop-bottom bucket suspended from a telpher. It operates at the rather high voltage of 185, there being available a transformer capacity of 5,000 k.v.a. As would be expected, melting is very rapid, whilst the two minutes necessary for charging obviously make for the conservation of heat. About 35 min. is required for melting, 15 min. for composition and slag adjustment and a further 10 min. for superheating. The life of the roof compares favourably with established practice and lasts about 120 heats. The graphite electrode consumption, too, is about normal for steel practice at 11 lbs. per ton. Thus, so far, the process has been so standardised that a production of 7,000 lbs. per hr. can be relied upon, associated with a current consumption of 600 units per ton.

However, such a process would fail entirely to meet the needs of a modern quantity-production plant owing to the inherent defect of batch as against continuous production; so it is arranged to work duplex with a 7-ton reservoir furnace. This latter furnace is of a similar type and has similar shell dimensions. It has a transformer capacity of 750 k.v.a. and operates with a current consumption of 200 units per ton. This furnace is required to be ready with a full charge of superheated metal for the arrival of the day shift. The transference of liquid metal from the primary furnace to the reservoir furnace is effected by hinged spout. As the former furnace is located at a higher level than the latter, it allows the spout to be hinged at the upper end, and to slide along a rest at the lower support. The electrode consumption tends to be somewhat higher than in the melting furnace and averages 12 lbs. per ton. The casting temperature is controlled within the range of 1,590 to 1,620 deg. C.

It is interesting to note that hydraulic power is used for the tilting mechanism of both furnaces, and motor operation for electrode regulation. From here the metal is transferred into 50-lb. shanks suspended from a monorail running parallel with the mould conveyor. Eight to nine casts are made daily in the melting furnace.

The brake-drum moulds are made on four pairs of moulding machines of the jolt-squeeze type, and placed on a pendulum conveyor. After casting they immediately enter an enclosed and ventilated cooling chamber to emerge at the knock-out. Here, without removing all the sand, they are attached to a chain conveyor, which is of the order of four-fifths of a mile long to ensure an equalisation of cooling conditions, to simplify handling and to prevent even temporary accumulation. It is a Ford principle to avoid as far as possible the heaping up of components at any one place, reliance being placed on the adherence to a daily manufacturing schedule which feeds the machine shops according to a predetermined demand. On their return, the headers having been removed, the castings are subjected to a heat-treatment carried out in a roller-hearth electric resistance furnace. This treatment consists in heating up the castings from cold to a temperature of 900 deg. C., during a period of 1½ hrs., maintaining this temperature for 3 hrs., and then quickly reducing the temperature to 730 deg. C. During the next half hour, the castings are gradually reheated to 760 deg. C., from which temperature they cool during a 4-hr. period to room temperature.

After a thorough cleaning in an airless type of shot-slinger, they are snagged and ground and then attached to the conveyor feeding the machine shops.

Malleable Cast Iron

It is probably truthful to say that, so far as this country is concerned, the methods used at Dagenham for the manufacture of malleable cast iron are unique. Not only are continuous methods of production employed, but because of the use of a short annealing cycle, the production per square foot of floor space borders on the incredible. It must be admitted, however, that there is some evidence of congestion, but it must be remembered that this department has had to be superimposed upon an existing foundry layout.

Duplexing is practised, not in this case to procure a continuous production but establish a precise compositional control associated with a constant and adequate superheat. Metal is brought down at the rate of eight tons per hour in a cupola of design unknown in this country. It is of 60 in. diameter, furnished with two rows of seven tuyeres and carrying a 12-in. lining. It is mechanically charged—a factor to be referred to later—and operates at a 13 : 1 coke ratio. This low ratio is a matter of which the Ford staff are rather proud, as the charge consists of approximately 50 per cent. steel and 50 per cent. runners and risers, whilst a tapping temperature of 1,565 deg. C. is definitely obtained. A certain amount (something around 2.5 per cent.) of silicon as ferro-silicon is added in the cupola. Whether this is responsible for a modicum of heat-giving reactions can be left to those who feel like preparing a thermal balance sheet. The cupola directly feeds into a 15-ton capacity electric furnace through a launder, and herein a soda-ash desulphurisation treatment is carried out. In this furnace, which is of the three-electrode three-phase acid-lined type, compositional adjustments are made following rapid chemical analysis made in a nearby chemical laboratory. These additions are made from the cupola stage. When they have been carefully weighed out, the cupola man blows a whistle and the electric-furnaceman thereupon raises from the roof of his furnace a circular 2 ft. diameter refractory-lined cover by the operation of a lever action. Then a shoot is quickly manœuvred into position, and the additions such as ferro-alloys are spilt down it. This furnace operates at a current consumption of 230 units per ton. This superheats the metal to give a tapping temperature of from 1,620 to 1,650 deg. C., the former figure being the minimum permissible. The metal is poured into a 5-cwt. drum-type ladle, wherein 15.2 ozs. of aluminium per ton is added. This ladle acts as a receiver, and from it are filled 50-lb. capacity hand shanks suspended from a monorail. In the main, the malleable castings made are for chassis parts, the braking system and rear-axle housings. Something of the order of 114,000 castings are made each month, this bulk being made up of 60 different patterns. To do this, the melting plant only operates on alternate days for the production of malleable, as it also has to undertake the very important task of providing metal for cast crankshafts and camshafts on other days.

The moulding is carried out on six pairs of jolt squeezers, with an extra machine in reserve. The facing sand used has the following properties, as measured by A.F.A. standard apparatus: Permeability, 80 to 110; compression, 10 to 13 lbs. per sq. in.; and moisture, 3 to 3.5 per cent. The permeability of the backing sand is lower, at 90 to 130, as is the compression, which is 7 to 9 lbs.

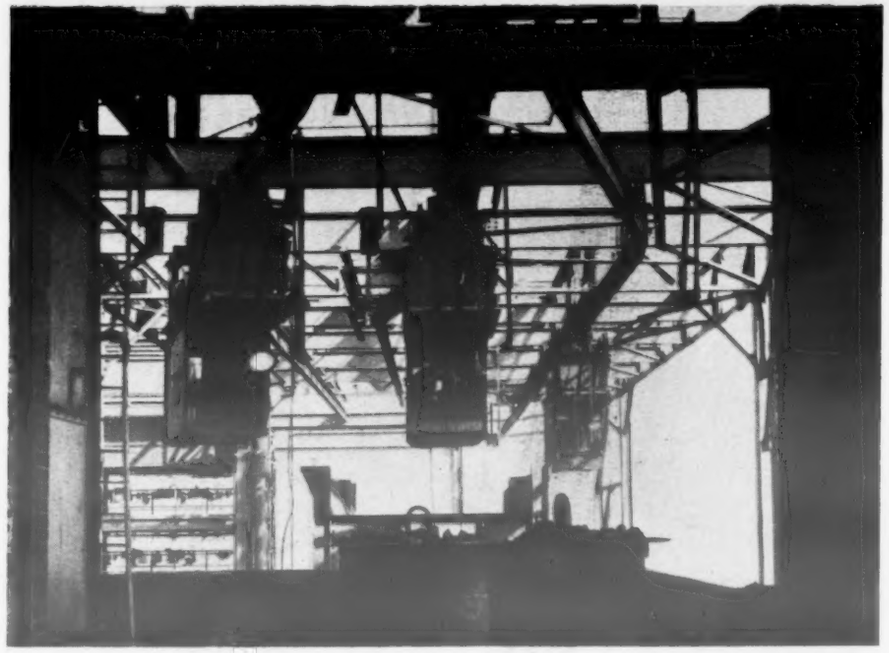
The conveying of the moulds for casting, cooling and knocking-out follows the normal and now well-known system employed at Dagenham. A minimum of work is done upon the hard castings, and the rough fettling merely amounts to knocking off the headers. No snagging or grinding is effected before annealing. After the usual "ride" for cooling, the castings arrive at the annealing plant. Here they are packed into pots, using no medium whatsoever, either oxidising or neutral; care is taken so to place them that a minimum of warping occurs. Most of the boxes are corrugated, but a few plain cylindrical ones are still in service. These boxes are approximately 4 ft. by 2 ft. by 18 in. high and carry a ½-in. thick section. They are covered by a flat lid cast in two halves. A high-chromium iron is used for casting them, and an average composition is of the order of C 3.0, Si 2.5 (max.) and Cr 15 to 18 per cent. After each passage through the furnace, the pots are sprayed with a silica-flour wash whilst still hot. By so doing lives of the order of 2,688 hours are regularly being achieved. An experimental pot has just given 5,834 hours. The pots are set on a wheeled bogie, there being three tiers of three pots per bogie. Such a load will carry 2½ tons of castings. Every five hours a bogie is pushed by power into the oven and one leaves at the opposite end. The oven is fired by coke-oven gas, and as this fuel is not available to the average malleable foundry, the publication of consumption figures would not be of much interest. The composition of the castings is standardised at C 2.3, Si 1.25 to 1.65, Mn 0.3 to 0.6 and Cu 0.75 per cent., and they are rendered malleable by the following cycle:—Two hours' heating to 900 deg. C., a further two hours to reach 935 deg., at which temperature they are maintained for 12 hrs. Then during the next hour the temperature is decreased to 885 deg., and then to lower the temperature to 775 a further 18 hrs. is occupied. The temperature is then relatively (two hours) quickly dropped to 535 deg. C., and thereafter a reasonably slow cooling. In practice the furnace is divided into nine zones, and the castings remain five hours in each, and the following shows the control temperature for each zone:—

Zone No. ..	1	2	3	4	5	6	7	8	9
Temp. deg. C. →	955	955	785	760	750	730	705	675	5 hrs. to cool

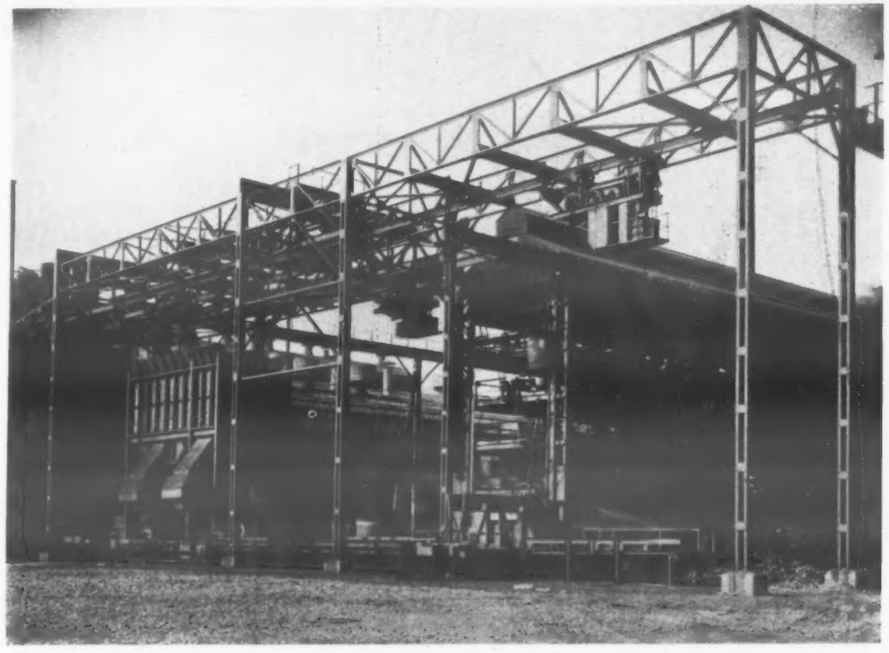
On discharge, the bogie is pushed back by means of transfer bogies to near the entrance to the furnace, where the pots are emptied, the castings put through a shot-slinging type of airless cleaning machine, then passed through to a line of double-headed grinders for snagging, and finally filled into trays for transport by overhead chain conveyor to the machine shops. These castings regularly pass a test demanding a 27-ton tensile associated with 15 per cent. elongation.

It is significant of the organising ability of this concern that the whole of the annealing and fettling is carried out in an area measuring 80 ft. by 50 ft., and yet a daily production of 12 tons is achieved.

Roller-Hearth Furnace for Heat-Treating Silicon-Copper Alloys.



Some of the Telpher Charging Machines.



Cooling Conveyor Tower, incorporating Automatic Scrap Sorting.

Type of Lifting Baskets Used for Scrap Sorting.

Views in the Foundries of Ford Motor Company, Limited, Dagenham.

Mechanical Charging

It has been a *sine qua non* in motor-vehicle foundry practice that the hand charging of the cupolas was essential. However, because of the high rate of feeding now demanded, any advantages of hand charging were largely lost. At any rate, no depreciation in quality has been experienced at Dagenham since mechanical charging has been instituted. It is not proposed to enter too deeply into the handling system, but rather to indicate the general principles involved. The rather elaborate hot-metal shop has not been found to be necessary, for with the extensive experience now available, the blast furnace can be relied upon to work within very narrow specificational limits, whilst between that and the finished castings there are plenty of places for instituting rigid metallurgical control. The stocking grounds, for instance, permit of selectional grading on, say, a silicon basis, whilst a complete knowledge and grading of the back scrap allows of a refinement of control which adequately meets modern requirements. The pig-iron is handled from the stocking ground to the charge-preparing area by a magnet suspended from a crane, this method also being adopted for filling the scale car. The most interesting factor is the sorting of the back scrap, for in this case the system is married to the various cooling conveyors, some of which attain a length about four-fifths of a mile. On these chain conveyors are suspended tipping buckets, and by varying the lengths of the trip fingers, the buckets are discharged at selected points. The scrap falls down an inclined plane to fill its appropriate bin. This material, too, is loaded into the scale car, which travels close to an appropriate conveyor with live rollers. Here the contents are transferred to bottom discharge buckets, which are automatically pushed on to the conveyor. Later they are lifted by a telpher and racked out into the cupola charging door to rest upon a water-cooled wishbone shelf, when a lowering action from the telpher hook discharges the contents.

Grateful acknowledgement is made to the directorate and executive staff of Ford Motor Company, Limited, for the help given in the preparation of this article and for their readiness to supply added details, to any reliable concern, of the plant and processes they employ.

TYPE OF LIFTING BASKETS USED FOR SCRAP SORTING.

COOLING CONVEYOR TOWER, INCORPORATING AUTOMATIC SCRAP SORTING.

VIEWS IN THE FOUNDRIES OF FORD MOTOR COMPANY, LIMITED, DAGENHAM.

Gillett & Johnston, Limited, Croydon

THE interest of visitors to the Croydon Foundry will be centred in the products, rather than in the process of manufacture. The revolutionary advances which during recent years have been made in foundry technique have left the bell foundry unchanged, and excepting, perhaps, in the methods adopted for bringing down the metal and the machines introduced for tuning the bells, the methods are much the same as were common practice a couple of centuries ago.

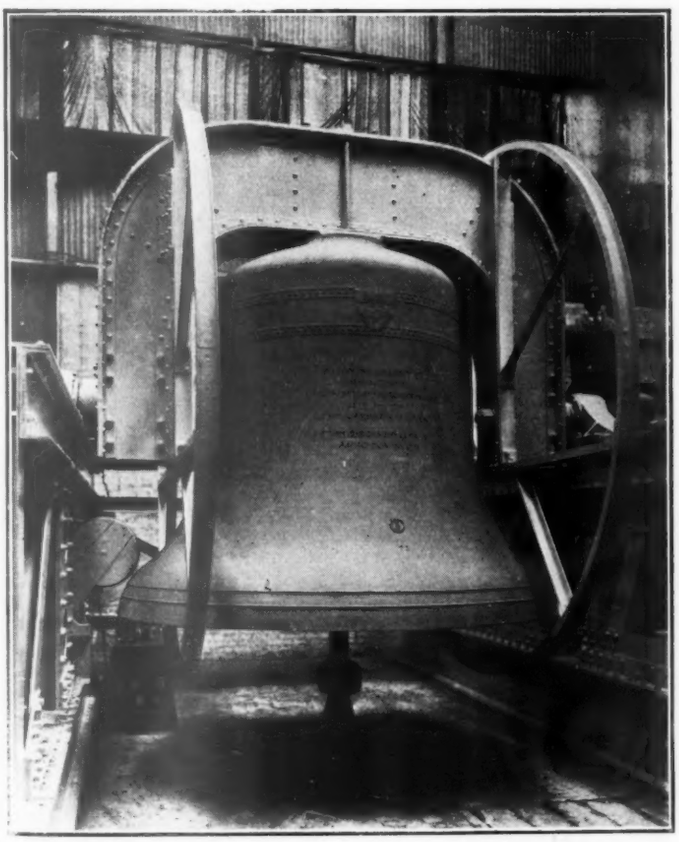
The casting of bells is amongst the oldest of our founding activities, bells being first introduced into England in about A.D. 400. The first set of bells having consecutive notes was installed in Crowland Abbey about A.D. 900. The oldest dated bell, however (1296), is at Claughton, Lancs.

Curiously enough the founder of the present business was not himself a foundryman. The present concern is the development of a business of a clockmaker, the late Mr. William Gillett, who established himself in a small way in the village of Hadlow, Kent, migrating from there to Clerkenwell and thence to the present site of the works in 1844. It was not until 1877, when Mr. Arthur A. Johnston became a partner and the company commenced to trade under its present style, that the bell foundry was developed. In the manufacture of tower clocks a very high reputation had already been established.

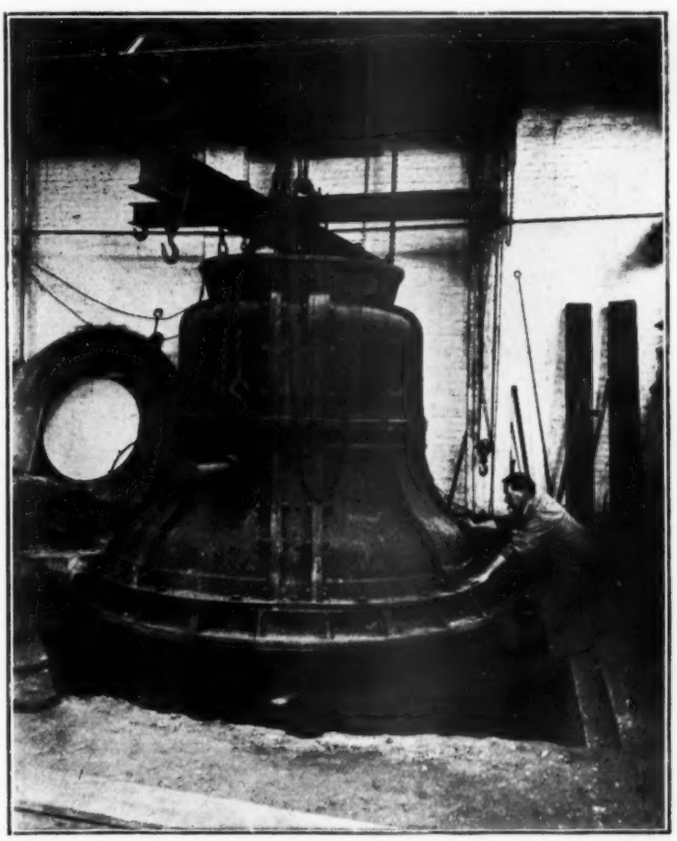
The development of the bell-founding industry was not only equally successful, but it was exceptionally rapid; in point of fact the present monthly output of the factory is equal to that of a full year's working seven years ago. For tuned bells the company have a world-wide reputation, and some of the most important contracts in the world have been carried out at the Croydon Foundry. For example, the largest carillon in the world was cast by the company and is installed at the Riverside Drive Church, New York. The Bourdon Bell, note C, weighing 18¼ tons and measuring 10 ft. 2 in. in dia., is the largest bell which has ever been cast in the United Kingdom, and it may be noted that it is the largest tuned bell in the world.

Moulding the Bells

The method of moulding is not without interest. To cast a bell two parts are required. The outer mould is formed in an iron case, lined with loam; a strickle board is fixed to an arm which is supported by a central bar and the sweep is rotated until the loam lining is built up to the form required for the exterior of the

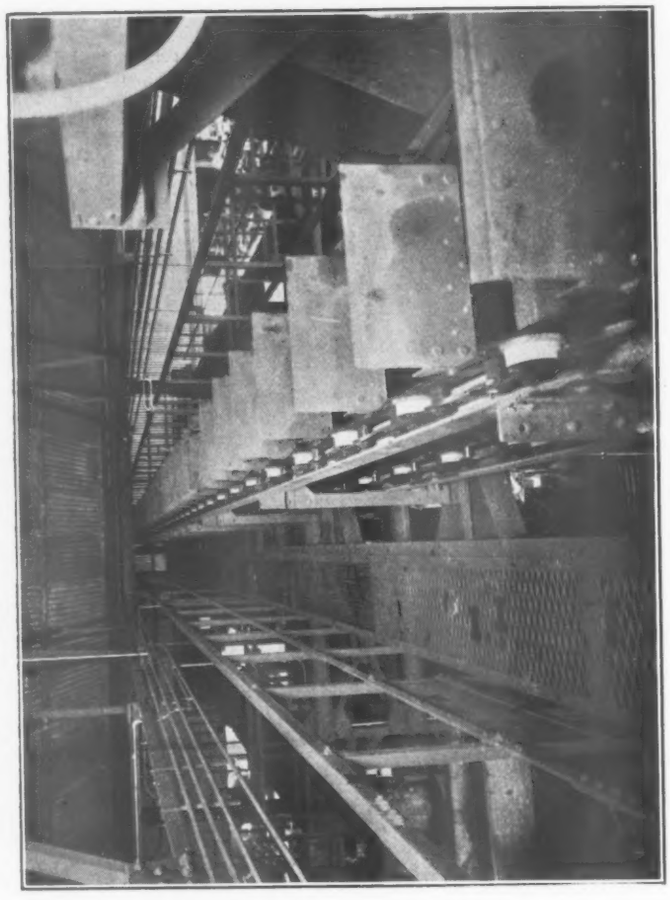


18¼-TON BOURDON BELL FOR THE LARGEST CARILLON IN THE WORLD—CAST BY GILLETT & JOHNSTON, LIMITED.



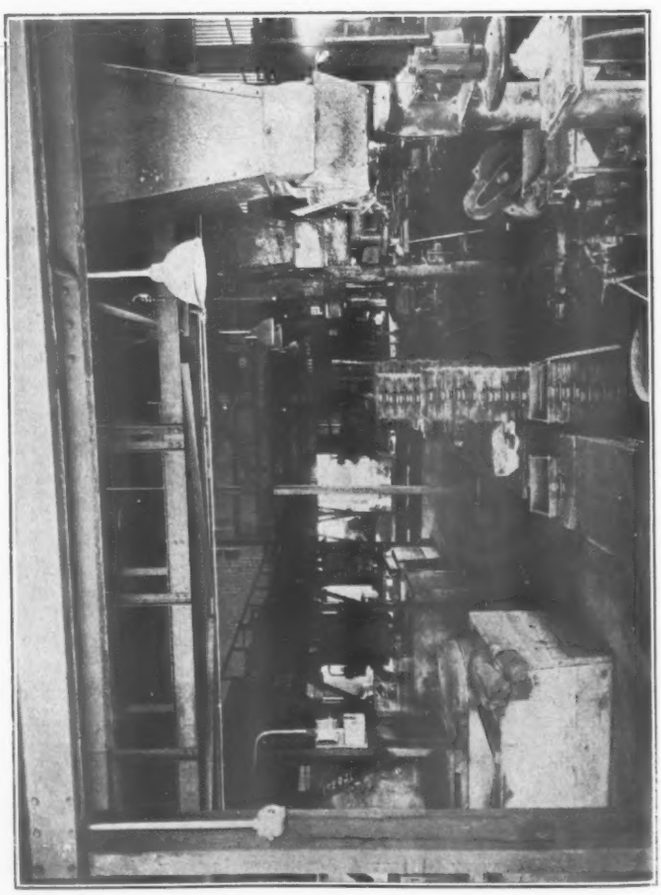
LOWERING THE OUTER PART OF A BELL MOULD OVER THE INNER PART AT THE CROYDON FOUNDRY.

THE MOULD CONVEYOR AND THE KNOCK-OUT IN THE GLACIER METAL COMPANY'S FOUNDRY.



FLIGHT CONVEYOR FEEDING THE MOULDING-MACHINE HOPPERS. GLACIER METAL COMPANY, LIMITED.

GENERAL VIEW OF THE FOUNDRY OF THE GLACIER METAL COMPANY, LIMITED.



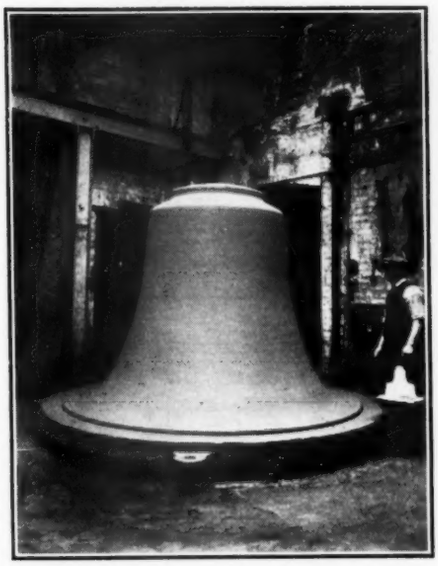
MOULDING-MACHINE PLANT AT THE GLACIER METAL COMPANY'S FOUNDRY.

bell. The inner part, or what one might call the core, consists of a structure built of bricks coated with loam in the same manner as that employed with the outer part. These constitute what are termed the rough coats, and the complete mould is then placed in coke-fired drying ovens. This drying, in the case of a medium-sized bell, may take two or three days, or as much as two or three weeks for a large bell. The moulds, after drying, are coated with a second, a finer mixture of loam, and again returned to the drying stoves, for the final drying, and after blacking the mould is ready for casting.

Bell metal is a correctly proportioned alloy of pure copper and tin. Every care is taken to ensure that only the purest metal is used, as also that it is treated scientifically in the process of preparation and melting. Pouring temperatures are also critically defined, and rapidity of operation is therefore essential. At the Croydon Foundry, the casting of an 18-ton bell is accomplished in about ten minutes.

Melting Plant

The melting plant consists of two reverberatory furnaces of a capacity of 12 tons and 6 tons respectively. Prior to the Coal Strike both furnaces were coal-fired, but difficulties in obtaining fuel led to the smaller furnace being equipped for oil-firing, with such satisfactory results that the system has been retained. The oil is pumped from the carrying lorries to an overhead tank, from which it gravitates to the burners at the furnace. It is claimed that by comparison with oil, gas and electricity, coal is the cheapest heating medium. On general lines this is definitely true, but in certain applications there are indirect economies resultant from the use of oil firing which justify its pride of place. In the case of the reverberatory furnace, for example, heats are more readily and rapidly attained and maintained than would be possible with solid fuel, whilst stoking, ash handling and ash disposal are eliminated. This last is often a problem in many districts. In addition to the reverberatory furnaces, metal is melted in a Morgan coke-fired furnace of 1,000 lbs., and a Monometer oil-fired furnace of 300 lbs.



"Core," struck up in Loam, for a Large Bell cast by Gillett & Johnston.

The foundry floor is served by two overhead cranes of 12 tons and 7 tons capacity.

The brass foundry contains four pot furnaces each of 120 lbs. melting capacity. The company have recently received an order for 10,000 small hand bells, and in order to deal expeditiously with this order they have installed a jolt-ram and squeeze machine by the Foundry Equipment Company, Limited. The machine is an entirely self-contained unit, complete with air compressor, etc.

For moulding, Plumstead loam is used exclusively. Being not quite so heavy in character, it has proved particularly suitable for bell founding. The loam is prepared in a pan mill, and it is not reconditioned after service in the foundry.

Glacier Metal Company, Limited, Alperton

THE Glacier Metal Company, Limited, is the development of a business established by the late Mr. C. W. Findlay in Kentish Town some 40 years ago for the production of bearing metal. The activities were transferred to the present site, Alperton, Wembley, in 1923, when extensive machine shops were laid out for the manufacture of finished bearings. At the same time the foundry was laid out for the production of high-grade bearing bronzes, bronze shell castings, and castings for the trade in special non-ferrous alloys.

To-day, the manufacture of bearings is of a very highly-specialised order. One might well say that specialisation is obligatory, for the trend in the mechanical world is to demand heavier duties and higher speeds with lighter parts. Moreover, it must be recognised that initial and maintained efficiency, combined with freedom from breakdown, is very largely dependent upon the design of the bearings and the composition of the metal used in their manufacture.

The manufacture of bearings is, one might say, a logical development of bearing-metal founding. The Glacier Metal Company have certainly justified their enterprise, for the works have been in an almost constant state of expansion, and to-day, from the foundry to the finished production, may be said to represent the latest word in the technique of bearing manufacture.

It will be interesting to note that the workmen, numbering now some 1,200, have an unusual consideration, being allowed ten minutes to visit the works' canteen in both the morning and afternoon working periods. Calculated, as of course it must be, on a man's week's work basis, the arrangement represents a heavy charge upon the company; however, the management are satisfied that the concession is justified and that it is not responsible for any reduction in output.

The Foundry

The foundry has an output of 20 tons of castings per week, for the most part special alloys and in particular bronzes. The melting plant, which is assembled along one side of the building, consists of four 300-lb. and one 500-lb. "British" reverberatory furnaces, and six pit furnaces each of 100 lbs., the whole being oil-fired.

Generally, casting production is sectionalised; for example, the manufacture of castings in leaded bronze alloys is carried out in a shop which forms an annex to the main foundry and in which is a McNab moulding machine. Here, over 200 sizes of bush castings are produced. These are machined to precise tolerances and held as a stock line for immediate delivery as Glacier precision finished lead bronze bushes. These bushes possess qualities which are lacking in either extruded bronzes or chill-cast phosphor bronze bars and readily adjust themselves to inaccuracies of alignment besides operating very successfully in locations where lubrication is of a very scanty or intermittent nature.

A further section of the foundry is laid off for the production of chill-cast, either solid or cored, phosphor bronze, a pit being provided for the chills, and castings are made up to 3½ cwts. in weight.

Mechanisation in a foundry producing castings in a wide variety of alloys is a difficult proposition, and unless very carefully considered may lead to confusion or become unduly complicated. The equipment of the Glacier foundry was carried out by the Universal System of Machine Moulding & Machinery Company, Limited, and is an outstanding example of mechanisation being carried to, but not one step beyond, economic limits. Free from all mechanical complications, the plant is delightfully simple, and of very robust construction. The sand-handling plant in particular is singularly compact, and it is truly automatic in action.

The knock-out grid is placed above a vibratory riddle of the mechanical type in which the vibrations are obtained through eccentric rocking masses. These vibrations are transmitted through the knock-out grid, which is in three sections and placed loosely on its frame. It will be readily appreciated that with this action the sand passes through the grids without coaxing.

The receiving hopper has a capacity of 15 tons, its delivery being by means of a 6-ft. 6-in. dia. rotary-feed plate. The feed is regulated by means of ploughs, whilst the drive is through "V" belts. From the rotary-feed plate the sand is delivered on to a 12-in. belt conveyor, which discharges into a 15 tons per hr. Ronceray sand-rubbing machine. The discharge from the machine is continuous into an elevator approximately 31 ft. in height, which delivers on to the flight conveyor, more or less of the orthodox type, set between 54-ft. 6-in. centres. Special attention has been given to the size of the driving drums. This conveyor is carried on the main steel structure, so designed as to permit the good lighting of the building to be used to the fullest advantage. The flight conveyor discharges into the stock hoppers over the machines.

Excess sand is discharged evenly on to two transverse conveyors, each 12 in. wide, which deliver on to two similar belts; from these last the sand is discharged into cylindrical hoppers placed over the tubs of the hand moulders. The hoppers are of a design which permit the hand moulder readily to obtain his supply.

Moulding Machines

There are four machines of the pneumatic type, working at a pressure of 90 lbs. per sq. in. They are of the jolt and squeeze type, fitted with draw, slow at the beginning, rapid towards the end of the stroke. The moulds from the machines, as also those from the hand moulders, are placed on one of two mould conveyors 180 ft. in length built up of skeleton plates 3 ft. 3 in. by 1 ft. 7 in. Upon these plates are fitted further mild-steel plates which are hinged on the inside and provided with a runner on the outside; the effect is the inclination of the top plate adjacent to the pouring point in the run, casting being done whilst the mould is at an angle. The inclination is approximately 1½ in., and after pouring the plate gradually assumes the horizontal on its way to the knock-out.

The mould conveyors are carried on runners

housed in ball-bearings, and each plate is guided in an inner track by means of horizontally placed runner guides, with ball-bearings. The drive for each conveyor is through variable-speed motors, which permit of a rate of feed to meet requirements.

The practice is to fill on to one conveyor at a time, as this gives the necessary lag between the pouring periods. Whilst the second conveyor is being filled the first is being cleared of moulds.

All metals are strictly controlled by the laboratory. The temperature of each melt is controlled by a pyrometer reading which registers on a central instrument, and thus correct temperature when pouring is maintained.

The fettling shop contains the usual sand-blast chamber, grinders and other auxiliary equipment.

The works are laid out with generous surrounding pathways, the shops well lighted and well ventilated. There is throughout the whole of the works a scrupulous cleanliness and a neat orderliness which is as pleasing as it is impressive, whilst very definitely it is reflected in the quality of the output, and probably also in the quantity.

The foundry, with which visitors will be most directly concerned, is, needless to say, laid out on the most modern lines. As will be seen from our illustration, it is covered by one roof, consisting of ten bays with north lighting, and the floor is provided with clearly-defined alleyways, which are kept free from obstruction and clean.

Sidings from the railway serve the stocking ground immediately at the rear of the melting plant, which consists of two cupolas, each of

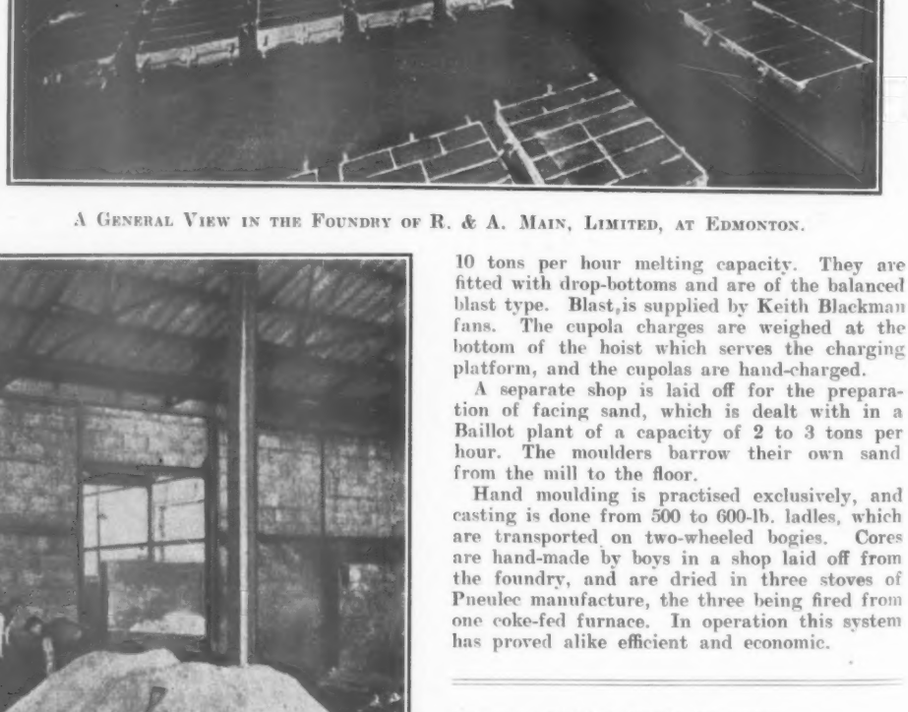
R. & A. Main, Limited, Upper Edmonton

R. & A. MAIN, LIMITED, are amongst the largest manufacturers of gas cookers, gas fires and auxiliaries in the kingdom. The Gothic Works, Edmonton, were commenced in 1899. Two years previously the firms of Thos. Glover & R. & A. Main had amalgamated, and the rapid growth of production on both sides necessitated the planning of a works on lines which would provide for expansion as circumstances demanded.

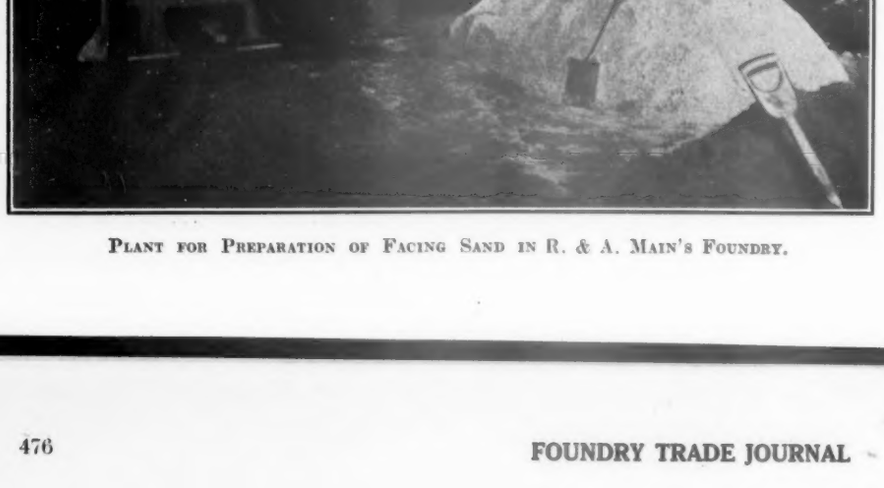
With this end in view, a site of approximately 24 acres was acquired at Edmonton. In the planning and equipment of the works, the accumulated experience of the two companies concerned was naturally turned to profitable account, not the least important feature being the positioning of the departments to ensure a continuity of operations and the allocation of the machines in the various departments to facilitate a straight run through without overlapping or congestion.

At the same time, due consideration had to be given to future necessities and provision made for extending any or all of the various sections of the works without interference with its continuity.

Since the works were started up, extensions have been almost constantly in progress, and the present area of the factory is upwards of 14 acres. So carefully, however, was the original layout planned that, considerable though the extensions have been, they form nothing more than a further step towards the completion of a constructive scheme.



A GENERAL VIEW IN THE FOUNDRY OF R. & A. MAIN, LIMITED, AT EDMONTON.



PLANT FOR PREPARATION OF FACING SAND IN R. & A. MAIN'S FOUNDRY.

10 tons per hour melting capacity. They are fitted with drop-bottoms and are of the balanced blast type. Blast is supplied by Keith Blackman fans. The cupola charges are weighed at the bottom of the hoist which serves the charging platform, and the cupolas are hand-charged.

A separate shop is laid off for the preparation of facing sand, which is dealt with in a Baillot plant of a capacity of 2 to 3 tons per hour. The moulders barrow their own sand from the mill to the floor.

Hand moulding is practised exclusively, and casting is done from 500 to 600-lb. ladles, which are transported on two-wheeled bogies. Cores are hand-made by boys in a shop laid off from the foundry, and are dried in three stoves of Pneulec manufacture, the three being fired from one coke-fed furnace. In operation this system has proved alike efficient and economic.

Congress Delegates Should Remember . . .

That they are requested to attend all functions 5 minutes before the scheduled starting times: this will assist in the smooth running of the various events. . . . That the wearing of the special Congress Badge will help to avoid any confusion. . . . That they may have their correspondence forwarded to them during the Congress period: it should be addressed: c/o The Institute of British Foundrymen, The Dorchester Hotel, Park Lane, London, W.1, and be collected from the Registration Office and Information Bureau.

The National Physical Laboratory, Teddington

WHILST this great national establishment should not really be included under the heading of a works visit, yet to-day there is some justification for it. On the one hand industry provides itself with much of the equipment of the scientist for control and development purposes, whilst on the other hand, the National Physical Laboratory has, *force majeure*, to instal industrial plant, if only for the purposes of studying the influence of mass. The Laboratory was established in 1900, for the purpose of standardising and verifying instruments, for testing materials and for the determination of physical constants. It is housed in numerous buildings situated in the beautiful grounds of Bushey House at Teddington. There are eight major departments: (1) Physics; (2) Electricity; (3) Radio; (4) Metrology; (5) Engineering; (6) Aerodynamics; (7) Metallurgy, and (8) the William Froude Laboratory.

Naturally, the department holding the major interest for foundrymen is that devoted to metallurgy, the superintendent of which is Dr. C. H. Desch, a Past-President of the Sheffield Branch of the Institute of British Foundrymen, and an Edward Williams Lecturer. This department has a complete range of chemical, metallographic and ancillary laboratories, an experimental foundry and a sizable rolling mill. Apart from pure metallurgy, the department has undertaken a good deal of work into the fundamental properties of refractories. It is of interest to recall that "Y" alloy was discovered at Teddington. One of the researches which we believe is still in progress and which will finally, to our mind, have a profound influence on metallurgical thought is the determination of such gases as oxygen in various metals.

Visits to the aerodynamic department, where aeroplane parts are tested in the very large wind tunnels, invariably provoke interested comment because of both size and the ingenuity displayed. Another department, the Froude Tank, is one which arouses a maximum of interest, because it is possible in this fair-sized elongated bath to test how propellers and various shapes of hulls behave. The major interest of the laboratories is, however, that it is invariably dynamic, and though the writer has been a constant visitor there for many years, he always finds a plethora of novelties exhibiting ingenuity in both conception and construction.

Sterling Manufacturing Company, Cubitt Town

SITUATE at Cubitt Town, on the north side of the Thames, the foundry is part of the works which was established rather more than 60 years ago for the manufacture of domestic wringers and garden rollers.

A few years ago the process of vitreous enamelling was adopted. With this process in operation there was an immediate and substantial increase in demand for the company's specialities, and the foundry, as it then existed, was speedily taxed beyond its limits. Space was also required for auxiliary shops; at the same time the available site was fully occupied.

Mr. B. B. Kent, the general manager, therefore determined upon a scheme of mechanisation designed by the Universal System of Machine Moulding & Machinery Company, Limited, the keynote of which is its extreme simplicity, with results which have more than justified the enterprise of Mr. Kent, a substantial increase in the production of castings being obtained on considerably less floor space.

The melting plant consists of three cupolas, the third being a recent addition by the Constructional Engineering Company, Limited. The cupolas are fitted with syphon bricks through which the flow of metal from the cupola can be started or stopped at will, by means of a lever arranged at floor level which controls the blast; when the blast is cut-off no metal is discharged. Blast is supplied by Keith Blackman fans.

Sand-Handling Plant

The knock-out is on to a grid through which the sand falls into a hopper feeding a bucket elevator. It is at this point that the new sand and coal dust additions are added. The elevator delivers by way of a magnetic separator on to a vibrating screen for the removal of hard pieces of core or foreign matter. The through material is discharged direct to a Ronceray continuous mill.

The sand leaving the mill falls to the boot of an elevator, by which it is raised and discharged on to a belt conveyor installed above the line of sand hoppers which feed the moulding machines and from which it is ploughed off into the hoppers as required.

The moulding machines include a machine of special design for making the "bows" of mangles, and a pair of hand-rammed stripping machines. These share one sand hopper, the sand being directed to either machine by means of a hinged pipe, which is fitted into the hopper bottom. Three P-type snap-flask machines are used for miscellaneous small castings, a pair of machines, O.P5 and R.P.5, respectively, for moulding the top and bottom halves for garden rollers, and a pair of A.F.P.60 machines which are normally engaged upon the production of parts for gas stoves.

The mould conveyor of the plate type completely encircles the machines; the moulds are assembled on stools placed at the side of the machines, whence they are placed on the mould conveyor, which carries the boxes past the pouring station, actually within a few feet of the tapping side of the cupolas, and thence to the knocking-out station.

In addition to the machines referred to, there is a 2-ton jolt-ram machine for the production of moulds for the side members of the larger sizes of wringers, etc.

Fettling

In the meantime the castings are barrowed from the knock-out to the fettling shop, where they are put through a Guttmann sand-blast machine operating at 22 lbs. per sq. in. pressure. Flash is next ground off on one of the three sets of double-headed grinders. As most of the castings have to be enamelled, they are passed through either a second sand-blast machine or one of two Jackman cabinets or a room in which they are shot-blasted at 75 lbs. per sq. in. pressure.

Checking Machine Production and Waste

A very simple and complete checking system is in operation. Each moulder is supplied with two sets of checks, *i.e.*, differently numbered. The two sets are necessary, as the moulder might have started on a different pattern before his previous mould had passed the knock-out. The moulder places a check on each box, and this is taken off by the man at the knock-out, who also notes the bad castings. The checks are collected every hour and recorded on a board outside the foundry manager's office. A daily report is also sent in from the fettling shop, showing the number of rejects of a particular casting, together with an explanation regarding the cause of such rejection.

Each day the records are tabulated upon a board in the foundry manager's office; he has thus at all times in front of him the output of each machine from a given pattern and the quality of the work for which each moulder has been responsible.

At the present time the foundry is more or less in a state of transition, the company having determined upon a scheme of complete reconstruction. The work incidental thereto has been entrusted to Universal System of Machine Moulding & Machinery Company, Limited. The new sand plant and core sand mixer are in process of installation, though it will be a matter of considerable time before the scheme can be carried to completion. The foundry is working at maximum output, and as any restriction of that output cannot, of course, be considered, the changeover must therefore of necessity be made piecemeal as it were.

E. R. & F. Turner, Limited, Ipswich

IT is interesting to note that the pioneers of the present company of E. R. & F. Turner, of Ipswich, which was founded in 1837, commenced the manufacture of chilled rolls so long ago as 1883. At this time the works were situated near the docks and railway station on the south-west side of Ipswich. The chilled-roll and grey-iron foundries were then entirely independent undertakings so far as their operation was concerned. The development of the roller flour-milling process created a demand for chilled-iron rolls which substituted rolls made from porcelain.

These pioneers were amongst the first to take up the manufacture of this type or class of chilled rolls. In 1883 a small but completely equipped foundry was erected by the company for the manufacture of chilled rolls for various purposes, since when the firm has twice rebuilt and enlarged its capacity.

In 1920 the company acquired a site on the Foxhall Road adjacent to the Derby Road Station on the L.N.E.R., and the present foundry was built and put in operation in 1921. No further developments took place until the last two years, when it was decided to remove entirely from the original works, namely, St. Peters Works, which is situated near the docks in College Street.

The shops were built and ready for occupation about August, 1938. It will be appreciated, of course, that to transfer a works as a whole unit without interference with the output to any

(*Continued on page* 480.)

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The Post-Congress Tour of Britain

FOR the convenience of the delegates this tour has been divided into two parts, each of virtually a week's duration. To avoid a somewhat tedious journey by road through the outskirts of London, train is to be taken on Sunday morning, June 18, as far as Banbury. From here to Birmingham motor coaches will take the visitors through Shakespeare's country, Kenilworth, Warwick and Leamington, a stretch of country as lovely as anywhere in England.

Monday is to be devoted to visiting foundries in the Birmingham area. The three works which are to act as hosts to the visitors are the Austin Motor Company; W. & T. Avery, Limited; and the Midland Electric Manufacturing Company. The Austin Works rank amongst the largest in Great Britain, and employ something of the order of 18,000 to 20,000 workpeople. The iron foundry is completely mechanised, whilst the control system for ensuring quality of product is of outstanding merit. Mr. Sheehan, the foundry manager, is reading a Congress Paper on one aspect of control—that of the core shop.

Soho Foundry of W. & T. Avery is a historic establishment, as on its site was the original foundry of Boulton and Watt, whilst Murdoch (the pioneer of the gas industry) was also associated with the firm. The present direction is extremely modern in its outlook and the factory is excellently equipped to produce an extremely wide range of weighing and testing apparatus. The Midland Electric Manufacturing Company ranks amongst the most progressive concerns in the kingdom. Within the last decade it has built three mechanised foundries, each one going a step further than the previous one. It operates a very extensive welfare department, characteristic of most large-scale British enterprises. Foreign visitors can regard this as ranking extremely high.

During Monday evening the visitors are to be guests of the Birmingham Branch of the Institute of British Foundrymen, over which Branch Mr. L. W. Bolton presides.

A Day in Derby

The next day (Tuesday) the party proceeds to Derby, where there are so many works visits that we suspect it will be impossible to inspect all of them. Taking them in alphabetical order, the first on the list is Bamfords, Limited, which, whilst being one of the largest agricultural implement manufacturers in the country, also makes Diesel, petrol and paraffin engines. Whilst not completely mechanised, it is thoroughly well-equipped with modern plant for sand reconditioning and moulding. The International Combustion Company is completely mechanised for the production of its smaller castings, and use is made of this plant for aiding the production of larger sized pieces where regular quantities are required, by tapping its sand supply and returning the used sand to it. Being a large boiler and pulverising works, there is also a large jobbing floor.

Ley's (pronounced to rhyme with keys) is the largest producer of malleable iron castings in Europe, its output being of the order of 20,000 tons per annum. Extensive use is made of pulverised fuel for firing the furnaces, whilst special note should be taken of the lay-out and equipment of the core shops. The core shop is also an outstanding feature at the works of Qualcast, Limited. They are said to be the largest producers of lawn mowers, except America, in the world, but since that claim was made they have amalgamated another business of the same type. They are also large manufacturers of grey-iron castings for the motor vehicle and electrical industries. Mr. Charles Bigg, who was President of the Institute two years ago, is works director.

Rolls-Royce is a firm which needs no introduction. Its products, because of their superb quality, find a ready market all over the world. The well-known series of R.R. alloys was originally developed at Derby. The Stanton Ironworks Company, we are now convinced, is the largest foundry concern in the world from the viewpoint of output. It pioneered the production of centrifugally-cast iron pipes. In addition the firm is a very important producer of foundry pig-iron. The managing director is Mr. E. J. Fox, whose name is inscribed on the Gold Medal which is the Institute's major award for eminence in foundry technique.

The East Midlands Branch of the Institute are acting as hosts at a dinner to be held in Matlock on the Tuesday. Matlock is a beautiful inland health resort situated amongst limestone scenery. Works visits in the Derby district are continued on Wednesday morning, and in the evening the party arrives in Sheffield, where they are to be entertained at a dinner-dance. Professor Andrew, the outgoing Branch-President, will probably preside over this function, though, and this also applies to other Branches, it may be the newly-elected President—in this case Mr. Malcolm Brown.

Sheffield Visits

Four works will be visited in Sheffield. First of all there is English Steel Corporation, part of which huge concern used to be the famous River Don Works of Vickers. The steel foundry is the department of major interest to the visitors; from here there is an output of 150 to 200 tons of steel per week. The largest casting ever made here—and it is thought to be the largest ever made in this country—weighed 150 tons. Two of the staff, Mr. T. R. Walker and Dr. Dadswell, are presenting a joint Paper to the Congress, which will add interest to the visit.

At Davy & United Engineering Company the visitors will also find a practical demonstration of what they have heard at the Congress, for the foundry manager (Mr. John Roxburgh) is reading a Paper on castings for heavy steelworks' plant. The foundry is a thoroughly up-to-date large jobbing foundry, possessing rigid metallurgical and technical control. The next works is Firth-Vickers Stainless Steel Company, and we hope that the visit will include an inspection of the Firth-Brown Research Laboratories, as they are amongst the best organised and equipped in the country.

The last on the list is the famous works of Hadfields, Limited, the birthplace of manganese steel. In addition to the foundry there are steelworks, rolling mills and armament departments. Mr. Roebuck is the director in charge of the foundry, and Mr. Dawson, another director, is giving a Paper to the Congress.

In the evening of Thursday, the party goes by train to Manchester, where there is a reception by the Lancashire Branch, to be followed on the Friday by three works visits—to Craven Brothers, Metropolitan Vickers and Mather & Platt. Craven Brothers manufacture machine tools up to 350 tons in weight. Naturally such masses involve special metallurgical treatment, and opportunity will be given to see something of their methods. The managing director (Mr. R. Greenwood) is a thoroughly practical iron-founder. The Metropolitan Vickers Company is one of the very largest manufacturers of power plant and electrical apparatus in the country. It operates a mechanised section and a large jobbing floor in the iron foundry, whilst the non-ferrous foundry activities range from minute die-castings to heavy copper-base components. The research department is very extensive.

Mather & Platt is amongst the leading establishments catering for Lancashire's vast textile industry. It has recently rebuilt its iron foundry on the most modern lines, whilst the non-ferrous section is outstanding in its class.

On the Friday evening a dinner is being offered by the Lancashire Branch to the guests. Either Mr. Grundy or Mr. Key will preside.

On Saturday morning the first part of the tour ends, but those fortunate enough to continue will be assured of a pleasant relaxation from works visits for two days. Sunday is to be spent in the Lake District, an unspoilt mountainous region possessing a charm of its own. Glasgow will be reached on Sunday night, and Monday is to be spent on the River Clyde, where intense industry gives place to beauty unequalled in any other British estuary.

Industrial Scotland

On Tuesday, there is a choice of no fewer than five works visits. Babcock & Wilcox have one of the largest boiler factories in the world and depend very largely upon exports for maintaining output. The works possess the world's largest plate bending press. The foundries, which have recently been modernised, embrace the manufacture of grey iron, both under mechanised and jobbing floor conditions, malleable and steel. The handling of the raw materials, and the conduct of the cupola plant, are both very intelligently carried out, and the fettling shop is worthy of special note. The Carron Company, established at the very birth of engineering industry, by Dr. Roebuck, has, despite its age, always kept abreast of the times and has set a very high standard in foundry practice. As this is the only light castings iron foundry to be visited in the provinces, foreign visitors will see how the foundry industry serves the building trades in a manner not generally practised abroad. Glenfield & Kennedy, Limited, is one of Britain's outstanding manufacturers of hydraulic machinery. It possesses both mechanised and jobbing foundries, and non-ferrous shops. For operating the Meehanite process it uses the largest oil-fired rotary furnace so far installed in Britain. Much research work is carried out on moulding sands. Harland & Wolff, Limited, are showing the visitors their Clyde Foundry, known locally as the Crystal Palace, because it has the largest glass roof of any building in the country! It makes marine engine and shipbuilding castings and furnished the engine components for the "Queen Mary," the "Queen Elizabeth" and the new "Mauretania."

The Singer Manufacturing Company produce the make of sewing machine bearing the name Singer, which is known in every village throughout the civilised world. For the production of the castings, a foundry of a very specialised character is required. Some of the core work is expeditiously carried out and handled by unique methods. G. & J. Weir have specialised in the very type of work which the average founder regards as "tricky" and prefers to leave to his competitors. This work includes marine auxiliary work, oil and electric pumps, heat exchangers for refineries, pure feed water evaporators, surface condensing plants and boiler-feed regulators. Both ferrous and non-ferrous foundries are in commission, and the meticulous control exercised both from the metallurgical and practical aspects is outstandingly good.

During the evening the visitors are to be honoured by a Civic Reception, at which Lord Provost Dollan will receive the guests.

After a day's sightseeing in Edinburgh on Wednesday, where we hope an opportunity will be given to see the Scottish National War Memorial—surely the most impressive to be found anywhere—the party proceeds to Newcastle on Thursday, there to pay more works' visits and attend the dinner given by invita-

(*Continued on page* 480.)

used for miscellaneous small castings, a pair of bottom. Three P-type snap-flask machines are

equipped foundry was erected by the company

(Continued on page 480.)

Delegates Attending the Congress

THE following is a list of those who, up to the early part of this week, had notified the Secretary of the Institute of British Foundrymen of their intention to participate in the Congress. Last-minute registration forms were still being received.

Great Britain

Prof. J. H. Andrew; Mr. and Mrs. W. Auckland; Mr. and Mrs. A. Augstein; Mr. and Mrs. J. Augstein.

Mr. G. L. Bailey; Mr. I. H. Baker; Mr. J. Bamford; Mr. J. S. Barry; Mr. and Mrs. H. J. Beck; Mr. and Mrs. A. S. Beech and daughters; Mr. and Mrs. James Bell, and Mrs. Dobson; Mr. W. E. Benbow; Mr. and Mrs. R. E. Berk; Mr. C. W. Bigg (Past-President of the Institute of British Foundrymen) and Mrs. Bigg; Mr. J. Birchall; Major and Mrs. T. G. Bird; Mr. and Mrs. Blakiston; Mr. J. Bolton; Mr. and Mrs. C. C. Booth; Mr J. R. Booth; Sir Paul and Lady Booth; Mr. P. C. Booth; Mr. C. D. S. Bridgett; Mr. and Mrs. E. D. Brown; Mr. E. J. Brown, Mr. M. Brown; Mr. and Mrs. R. H. Buckland; Mr. G. R. Buckley; Mr. and Mrs. H. Bunting; Mr. and Mrs. C. J. Burgess; Mr. and Mrs. A. Burn-Callander.

Mr. J. Cameron (Past-President) and Mrs. Cameron; Mr. and Mrs. A. Campion; Mr. A. E. Carlisle; Mr. and Mrs. G. C. Castle; Mr. and Mrs. W. C. Cathcart; Mr. J. V. Chatterton; Mr. L. Clarke; Mr. and Mrs. G. C. Clayton; Mr. F. J. Cook (Past-President); Mr. and Mrs. W. N. Cook; Mr. J. H. Cooper; Mr. E. J. Crawley; Mr. and Mrs. F. J. Cree; Miss N. Crook; Mr. and Mrs. C. W. Cumber; Mr. E. M. Currie.

Dr. and Mrs. C. J. Dadswell; Mr. and Mrs. S. E. Dawson; Mr. V. Delport (Past-President of International Committee) and Mrs. Delport; Mr. and Mrs. W. E. Dobson; Dr. and Mrs. J. W. Donaldson; Mr. N. L. Evans; Dr. and Mrs. A. B. Everest.

Mr. V. C. Faulkner (Past-President) and Mrs. Faulkner; Mr. and Mrs. T. C. Firth; Mr. S. W. B. Flavel; Mr. C. Fontaine; Mr. C. E. Foster; Mr. E. Foster; Mr. G. E. France (President, Foundry Trades' Equipment and Supplies Association) and Mrs. France; Mr. A. C. Furmston.

Mr. T. H. Gameson; Mr. and Mrs. J. W. Gardom; Mr. J. E. Garside; Mr. and Mrs. Gates; Mr. F. Gentles; Mr. and Mrs. N. L. Goodchild; Mr. J. T. Goodwin (Past-President); Mr. and Mrs. T. Goodwin; Mr. J. G. Gould and Miss H. Gould; Mr. and Mrs. T. H. Gray; Mr. and Mrs. C. Grice; Mr. D. Griffiths; Mr. H. Grundy; Mr. and Mrs. D. Guthrie.

Mr. E. W. Hale; Mr. J. K. H. Hall; Mr. C. B. Hallam; Mr. and Mrs. M. M. Hallett; Mr. G. L. Harbach; Mr. and Mrs. A. E. Harford; Mr. T. R. Harris; Mr. J. Hepworth, J.P., M.P. (President of the Institute), and Mrs. Hepworth; Mr. J. P. Higham; Mr. and Mrs. B. Hird; Mr. J. Hird; Mr. and Mrs. A. Hodgson; Dr. J. E. Holmstrom; Mr. and Mrs. Lennox Holt; Mr. and Mrs. Barrington Hooper; Mr. and Mrs. S. A. Horton; Mr. and Mrs. F. H. Hoult; Mr. E. J. L. Howard; Mr. and Mrs. C. A. Howe; Mr. and Mrs. F. Hudson; Dr. and Mrs. L. B. Hunt; Mr. J. E. Hurst (Past-President) and Mrs. Hurst.

Mr. H. Jarratt; Mr. C. Jennings; Mr. J. C. Jones; Dr. W. D. Jones; Mr. C. H. Kain; Mr. and Mrs. J. Ferdinand Kayser and Mrs. L. W. Kayser; Mr. H. W. Keeble; Mr. E. G. King; Mr. J. King.

Mr. C. J. Lake; Mr. P. B. Lake; Mr. W. B. Lake, J.P. (President-elect of the Institute); Mr. Wesley Lambert, C.B.E. (Past-President); Mr. W. T. Laverton; Mr. P. H. Lawrence; Mr. W. S. Lawson; Mr. J. E. O. Little; Mr. and Mrs. H. W. Lockwood; Mr. A. Logan; Mr. J. Lucas; Mr. E. J. Ludlow.

Mr. D. W. Maddock; Mr. T. Makemson (Secretary of the Institute and Honorary Secretary of the International Committee of Foundry Technical Associations); Mr. J. Markman; Mr. and Mrs. J. Masters; Mr. J. Masters, jun.; Mr. and Mrs. D. G. Mather; Mr. J. E. Mercer; Mr. H. W. Merritt; Major R. Miles (Vice-President of the Institute); Mr. R. A. Miles; Mr. H. J. Miller; Mr. and Mrs. D. M. Moir; Mr. and Mrs. W. H. Moore; Mr. E. R. Mort; Mr. and Mrs. A. J. Murphy; Mr. and Mrs. J. J. McClelland; Mr. and Mrs. F. E. McGrah; Mr. J. McLachlan; Mr. J. McClure Renwick; Mr. and Mrs. J. Nicholson; Mr. W. O'Keefe; Mr. H. Oliver; Mr. C. A. Otto.

Mr. A. H. C. Page; Mr. and Mrs. D. C. Patterson; Mr. A. E. Peace and Miss G. J. Nixon; Mr. F. C. Pearce; Mr. J. G. Pearce (Director, B.C.I.R.A.) and Mrs. Pearce; Mr. E. W. Picken; Mr. J. Picken; Mr. P. D. Pincott; Dr. G. H. Piper and Miss M. Cryan; Mr. and Mrs. R. Pipes; Mr. H. F. Poole; Mr. C. Powney; Mr. and Mrs. A. A. Prescott; Mr. J. H. Price; Mr. W. L. Proctor; Mr. A. F. Puddicomb; Mr. A. R. Purchase; Mr. W. Pyatt.

Mr. G. W. Reid; Mr. J. A. Reynolds; Mr. W. H. Richards; Mr. R. J. Richardson; Mr. and Mrs. N. D. Ridsdale; Mr. A. P. Riley; Mr. and Mrs. H. Roberts; Mr. H. B. Roberts; Mr. A. G. Robiette; Mr. F. W. Rose; Mr. and Mrs. W. F. Rowden; Mr. and Mrs. F. W. Rowe; Mr. J. Roxburgh; Mr. and Mrs. P. A. Russell; Mr. S. H. Russell (Past-President).

Mr. and Mrs. E. H. Sahlinger; Mr. and Mrs. W. B. Sallitt; Mr. and Mrs. W. Scott; Mr. and Mrs. T. Shanks and Miss Shanks; Mr. and Mrs. D. Sharpe; Mr. J. Shaw; Mr. and Mrs. J. J. Sheehan; Mr. H. H. Shepherd; Mr. and Mrs. A. J. Shore; Mr. G. R. Shotton; Mr. D. O. Sillars; Mr. J. Sillars; Mr. J. Sillavan; Mr. and Mrs. F. J. Skinner; Mr. and Mrs. J. A. Smeeton and daughters; Mr. and Mrs. A. E. McRae Smith; Mr. W. Smith; Mr. J. K. Smithson; Mr. R. Spriggs; Mr. J. F. Stanier; Mr. V. Stobie (Past-President) and Mrs. Stobie; Mr. Roy Stubbs (Past-President) and Mrs. Stubbs; Mr. J. C. Swan.

Next Thursday's Congress Number will give Full Reports and Pictures

Mr. and Mrs. T. H. Taft; Mr. and Mrs. C. H. Tanner; Mr. F. W. Taylor; Mr. H. Taylor; Mr. H. Thomas; Mr. and Mrs. W. Thomas; Mr. and Mrs. J. A. Thornton; Mr. and Mrs. G. P. Tinker; Mr. and Mrs. A. Tipper; Mr. S. E. Tompkin; Mr. B. H. Trenear-Thomas; Mr. and Mrs. A. C. Turner; Prof. T. Turner; Mr. T. H. Turner; Mr. T. Tyrie; Mr. V. E. Upton.

Mr. and Mrs. T. R. Walker; Miss E. M. Walmsley; Mr. J. Wastenay; Mr. S. Watson; Mr. F. W. Webster; Mr. and Mrs. G. R. Webster; Mr. F. G. Weidman; Mr. and Mrs. Walter West; Mr. and Mrs. A. J. While; Mr. and Mrs. C. G. While; Mr. and Mrs. L. P. Wilkes; Mr. and Mrs. F. J. Williams; Mr. A. M. Wilson; Mr. C. H. Wilson; Mr. and Mrs. F. Arnold Wilson; Mr. and Mrs. O. G. Wilson; Mr. and Mrs. W. R. Wilson; Mr. H. Winterton (Past-President) and Mrs. Winterton; Mr. and Mrs. A. S. Worcester; Mr. D. H. Wood (Vice-President designate) and Mrs. Wood; Mr. and Mrs. P. Wyatt and Mr. and Mrs. H. J. Young.

Canada

Mr. F. W. Bruce.

India

Mr. B. Ramaseshiah; Mr. V. S. G. Rao.

South Africa

Mr. A. D. V. Allan; Mr. A. B. Anderson; Mr. A. H. Guy (President, South African Branch of the Institute); Mr. A. H. Moore.

Basque

Mr. Santiago de la Torre; Mr. J. M. D. del Valle.

Belgium

Mr. and Mrs. J. V. Bairiot; Mr. and Mrs. P. Denis; Mr. J. Léonard (Past-President, International Committee of Foundry Technical Associations); Mr. C. T. Monseur; Mr. P. Ropsy (Past-President of International Committee).

Czecho-Slovakia

Prof. Pisek.

Denmark

Mr. C. A. Adler-Nissen; Mr. E. Borresen; Mr. A. Gottlieb; Mr. F. C. Krebs; Mr. and Mrs. V. Larsen, Miss Tove Larsen and Mr. V. H. Larsen.

Egypt

Mr. M. A. Moussa.

France

Mr. H. J. Baehr; Mr. and Mrs. Paul G. Bastien; Mr. Bensimon; Mr. and Mrs. A. Brizon; Mr. Cambier; Mr. L. Charleux; Mr. and Mrs. Coquegnot; Mr. M. David; Mr. Dewier; Mr. G. Durville; Mr. and Mrs. Gailly; Mr. G. Gauthier; Mr. J. Gustin; Mr. and Mrs. H. Laurent; Mr. J. Lobstein (President of the French Foundry Technical Association); Mr. J. V. Martiny; Mr. R. Ronceray; Mr. M. Rousseau and Miss M. C. Rousseau; Mr. A. Saboret; Mr. C. Schaeffer; Mr. and Mrs. Rene Théret; Mr. Viez; Mr. N. Vincotte.

Germany

Mr. K. Baenninger; Mr. E. Bertram; Mr. H. Damesch; Mr. P. Heuser; Mr. A. Heuvers; Mr. H. L. Honsel; Dr. H. Jungbluth; Mr. R. Kahlert; Mr. and Mrs. J. Kolodziej and Miss Kolodziej; Dr. C. Pardun; Dr. Parow-Souchon; Mr. Rauterkus; Mr. H. Reininger; Mr. W. Reiss; Mr. W. Rotmann; Mr. W. Schemann; Mr. K. Scmitz; Mr. and Mrs. H. Wachenfeld.

Holland

Mr. F. B. Bakker; Mr. J. J. Braat; Mr. and Mrs. L. de Leeuw; Dr. E. M. H. Lips; Mr. and Mrs. R. E. Martin; Mr. and Mrs. F. W. E. Spies; Dr. and Mrs. K. J. van Nieukerken.

Hungary

Mr. and Mrs. F. Altenstein; Mr. S. Beck; Mr. and Mrs. Deak and Mrs. Tanos Fenyo; Mr. and Mrs. R. Erdos and Miss Etelka Erdos; Mr. P. Feiner; Dr. C. Gardonyi; Dr. B. Koros; Mr. and Mrs. A. Szanto; Mr. and Mrs. Szasz; Mr. L. Wilhelm.

Italy

Mr. and Mrs. Mario Olivo; Dr. Guido Vanzetti (President, International Committee) and Mrs. Vanzetti.

Japan

Commander T. Fujita and Miss A. W. Scott.

Norway

Mr. and Mrs. G. R. Amundsen; Mr. A. Arstal; Mr. J. Gahr; Mr. J. Graham; Mr. T. Krogvig, Mr. A. Larsen; Mr. T. Mathisen; Mr. S. Pettersen; Mr. and Mrs. J. Sissener.

Poland

Mr. A. Dagnan; Mr. J. Dickman; Mr. and Mrs. Dobrzanski; Mr. C. Gierdziejewski (President, Polish Foundry Technical Association) and Mrs. Gierdziejewski; Mr. and Mrs. A. Harasowski; Mr. S. Kwiatkowski; Mr. G. Lutoslawski; Mr. and Mrs. S. Pelczarski; Mr. F. Staub; Mr. and Mrs. S. Zachwieja.

Russia

Mr. and Mrs. P. Chourin.

Sweden

Mr. and Mrs. A. Adolfsson; Mr. Y. Granstrom; Mr. A. Huldt; Mr. E. R. Ljungdell; Mr. C. G. W. Sporrong; Mr. G. Syren; Mr. J. Torjeson.

Switzerland

Mr. A. Dünner; Mr. P. M. Haeuri; Dr. R. Irmann.

United States of America

Mr. R. S. MacPherran; Dr. and Mrs. H. A. Schwartz; Mr. and Mrs. Oliver Smalley.

Congress Papers and Their Authors

ORDER OF PRESENTATION AT THE SIX TECHNICAL SESSIONS

Tuesday Afternoon, 2.30 p.m.

No. 658. "Bonding Clays and the Properties of Synthetic Moulding Sands," by G. H. Piper, B.Sc., Ph.D. (presented on behalf of the British Cast Iron Research Association).

DR. PIPER is a graduate of Oxford (Hons. B.A.), and is known as an inventor and research worker in various fields. Is now associated with a company developing his Duran process for "rubberising" hosiery.

No. 659. "Core Shop Control," by J. J. Sheehan, B.Sc., A.R.C.Sc.I.

MR. SHEEHAN is a graduate of the National University of Dublin. He is now manager of the foundries at the Austin Motor Company, Limited, Birmingham. He is a pioneer of synthetic sand for foundry use.

DR. G. H. PIPER.

MR. J. J. SHEEHAN.

No. 660. "The Selection and Testing of Cupola Refractories," by W. J. Rees, M.Sc.

MR. REES is the head of the Refractories Department at the University of Sheffield, and a recognised authority on the subject.

No. 661. "The Gating of Castings with Reference to the Stream of Molten Metal," by Dr. E. M. Lips (presented on behalf of the Nederlandsche Vereeniging van Gieterij-Technici).

DR. LIPS is a graduate of the Aachen Technical College and is now metallurgist to the N. V. Philips Lamp Works at Eindhoven, Holland.

No. 662. "Some Iron Castings for Steelworks Plant," by J. Roxburgh.

MR. ROXBURGH is foundry manager to Davy & United Engineering Company, Limited, Sheffield. He was apprenticed at the B.T.-H. works at Rugby.

Wednesday Morning, 9.30 a.m.

SESSION A

No. 663. "Recent Developments in the Centrifugal Casting Process," by J. E. Hurst.

MR. W. J. REES.

DR. E. M. LIPS.

MR. J. ROXBURGH.

MR. W. A. GEISLER.

MR. HURST is technical director of Bradley & Foster, Limited, and consultant to Sheepbridge-Stokes Centrifugal Castings Company. He is President of the International Committee for Testing Cast Iron.

No. 664. "Developments in the Centrifugal Casting Process in Germany," by W. A. Geisler.

MR. GEISLER, who has had experience of American foundry practice, is a recognised authority on centrifugal casting. He is now on the staff of Fried. Krupp A.-G., Essen, Germany.

No. 665. "Specially Hard Alloy Cast Irons for Resistance to Wear," by M. M. Hallett, B.Sc., and Dr. A. B. Everest.

Both AUTHORS are on the staff of the Mond Nickel Company. Mr. Hallett is a graduate of the University College, Swansea, and Dr. Everest of the University of Birmingham.

MR. M. M. HALLETT.

DR. J. W. DONALDSON.

No. 666. "The Thermal Conductivities of Some High-Duty and Alloy Cast Irons," by J. W. Donaldson, D.Sc.

DR. DONALDSON is one of the very few metallurgists who have received a D.Sc. from Edinburgh University. He is now chief chemist and metallurgist with Scotts' Shipbuilding & Engineering Company, Limited, Greenock. He is a Carnegie Scholar of the Iron and Steel Institute.

No. 694. "Defects in Electrically-Melted Chilled Rolls," by Dr. Ing. Franco Bondi (presented on behalf of the Federazione Nazionale Fascista degli Industriali Metallurgici d'Italia).

DR. BONDI was at one time on the staff of the Vanzetti foundry in Milan, and is now foundry manager to the Acciaierie e Ferriere Lombarde Falck. He is a specialist in electric furnace practice.

SESSION B

No. 667. "The Effect of Melting Conditions on Light Alloys," by A. J. Murphy, M.Sc., S. A. E. Wells and R. J. M. Payne, B.Sc.

MR. MURPHY and his colleagues are all on the metallurgical staff of J. Stone & Company, Limited, of London. Both Mr. Murphy and Mr. Wells were at one time at the National Physical Laboratory, where they were engaged upon metallurgical research.

No. 668. "The Effect of Melting Conditions on Gas Unsoundness in Metals," by G. L. Bailey, M.Sc.

MR BAILEY is a graduate of Birmingham University and is now chief officer of the Development Department of the British Non-Ferrous Metals Research Association.

No. 669. "Pressure Die-Casting in Zinc and Aluminium Base Alloys—the Limitations and Possibilities of the Process," by A. G. Street, B.Sc., Ph.D.

DR. STREET is a graduate of Birmingham University and is well known as an authority on

DR. ING. F. BONDI.

MR. A. J. MURPHY.

designing for die-castings. He is on the staff of the Birmingham works of Fry's Diecastings, Limited.

No. 670. "Light Alloy Melting Practice," by W. C. Devereux, F.R.Ae.S.

MR. DEVEREUX is well known through his association with the R.R. series of alloys. He is managing director of High Duty Alloys, Limited, of Slough.

No. 689. "The Influence of Repeated Remelting on the Properties of Light Alloys," by Ing. M. Hajek and Dr. J. Koritta.

DR. KORITTA is a graduate of Prague University and is now a leading member of the research staff of Ceskomoravská-Kolben-Danek Company. MR. HAJEK was trained at Brno and the Paris Foundry School; he is now superintendent of the C-K-D non-ferrous foundry.

No. 691. "The Solution Heat-Treatment of Aluminium Casting Alloys," by Dr. R. Irmann.

DR. IRMANN was trained at the Aachen Technical School. Since 1926 he has been engaged in research work at the Aluminium Industrie A.G. of Neuhausen, Switzerland.

MR. S. A. E. WELLS.

MR. R. J. M. PAYNE.

MR. G. L. BAILEY.

DR. A. G. STREET.

MR. W. C. DEVEREUX.

ING. M. HAJEK.

DR. J. KORITTA.

DR. R. IRMANN.

Friday Morning, 9.30 a.m.

SESSION A

No. 671. "Cutting Tools for Cast Iron," by H. Beeny, M.Met.

MR. BEENY is a graduate of Sheffield University and is now works metallurgist to Alfred Herbert, Limited, of Coventry.

No. 672. "Optimum Blast Volumes for Cupola Practice," by Dr.-Ing. N. Czyzewski (presented on behalf of the Stowarzyszenie Techniczne Odlewnikow Poskich).

DR. CZYZEWSKI is the Assistant Professor of Fuel Technology at the Mining Academy of Cracow, Poland.

MR. ZEHNDER, after much practical experience with George Fischer, of Schaffhausen, is now a director of the Britannia Iron & Steel Works, Limited, Bedford.

No. 695. "Laws Governing the Operation of the Cupola," by Dr. Ing. Massimo Barigozzi (presented on behalf of Federazione Nazionale Fascista degli Industriali Meccanici).

DR. BARIGOZZI is a graduate of the Milan Polytechnic. He is Vice-President of the Unione Lombarda Iron Foundry.

SESSION B

No. 675. "Process of Crystallisation in Commercial Alloys," by Dipl.-Ing. W. Patterson (presented on behalf of the Technischer Hauptausschuss für Giessereiwesen).

DR. PATTERSON is a lecturer and research assistant in the Foundry Section of the Technical School at Aachen.

No. 676. "The Progress of Inverse Segregation during Solidification," by Dr. J. A. Vero (presented on behalf of the Magyar Ontodei Szakem berek Egyesulete).

DR. VERÓ was trained at the Hungarian High School for Mining and Forestry. He is a Carnegie Research Scholar and is now a lecturer at his old school.

No. 677. "The Preparation of Alloys," by Professor A. Portevin (presented on behalf of the Association Technique de Fonderie de France).

PROFESSOR PORTEVIN is director of the Paris Foundry High School and is a Bessemer Medallist. He is universally esteemed as a metallurgist.

No. 678. "Control of the Solidification of Castings by Calculation," by Ing. N. Chvorinov (presented on behalf of the Ceskoslovensky Odborny Spolek Slevarensky v Praze).

Of Russian origin, MR. CHVORINOV was trained at the Pribram High School and Trent College in Derbyshire. He is now in the foundry department of the Skoda Research Institute.

No. 679. "Copper and Copper Alloys for Electrical and Thermal Conductivity Applications," by H. J. Miller, M.Sc.

MR. H. BEENY.

DR. N. CZYZEWSKI.

MR. G. R. SHOTTON.

DR.-ING. L. OLSANSKY.

DR.-ING. M. BARIGOZZI.

DIPL.-ING. W. PATTERSON.

No. 673. "Some Notes on the Design and Operation of the Open-Hearth Furnace for Melting Malleable Cast Iron," by G. R. Shotton.

MR. SHOTTON was trained in the metallurgical department of the Birmingham Central Technical College, and is now works manager of Shotton Brothers, Limited, of Oldbury.

No. 685. "Study of the Corrosion of Steel and Cast Iron Pipes," by Dr.-Ing. L. Olsansky (member of the Ceskoslovensky Odborny Spolek Slevarensky).

DR. OLSANSKY is a graduate of the University of Brno, and is technical manager of the Municipal Gas Works of that city.

No. 692. "Some Aspects of Malleable Cast Iron Pipe Fittings Manufacture," by C. Zehnder.

MR. MILLER is a graduate of Birmingham University and is now a metallurgist on the staff of the Copper Development Association.

No. 693. "General Principles of the Compounding of Alloys," by the Technical Committee of the Association Technique de Fonderie de Belgique.

Friday Afternoon, 2.30 p.m.

Joint Meeting with the Iron and Steel Institute

No. 681. "Development and Organisation of Steel Foundry Research," by W. J. Dawson.

MR. DAWSON was trained in the Metallurgical Department of Sheffield University. He is now director in charge of metallurgical operations at Hadfields, Limited, of Sheffield. He is chairman of the Steel Castings Research Committee.

DR. J. A. VERO.

ING. N. CHVORINOV.

MR. H. J. MILLER.

MR. W. J. DAWSON

MR. F. W. ROWE.

DR. C. J. DADSWELL.

No. 682. "Radiography in Iron and Steel Founding," by F. W. Rowe, B.Sc.

MR. ROWE is a graduate of Manchester University and is works manager of the Penistone foundry of David Brown & Sons (Huddersfield), Limited, where the Randupson process is used.

No. 683. "Notes on Dry-Sand Practice for Steel Castings," by C. J. Dadswell, Ph.D., B.Sc., Ing.E.S.F., and T. R. Walker, M.A.

Both AUTHORS are on the staff of the English Steel Corporation, Limited, of Sheffield. Mr. Walker, who is a graduate of Cambridge University, is chief chemist, and Dr. Dadswell, who has his degrees from London University, is the only Englishman to have received the diploma of the Paris High School. He is manager of the Grimesthorpe Steel Foundry.

No. 684. "The Renaissance of the Steel Casting and the Rôle of the Metallurgist," by F. A. Melmoth (presented on behalf of the American Foundrymen's Association).

MR. MELMOTH was trained in the Metallurgical Department of Sheffield University. Before leaving for the States he was foundry manager to Lake & Elliott, Limited, of Braintree. He is now Vice-President in charge of operations of the Detroit Steel Castings Company.

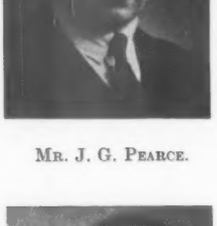
No. 674. "The Effect of the Materials of the Charge on the Properties of Cast Iron and Steel," by Dr.-Ing. P. Bardenheuer.

DR. BARDENHEUER is still another graduate of the Aachen Technical School to present a Paper. Since 1922 he has been a leading member of the staff of the Kaiser-Wilhelm Research Institute at Düsseldorf.

MR. F. A. MELMOTH.

MR. J. G. PEARCE.

DR.-ING. P. BARDENHEUR.



MR. A. H. GUY.

Papers to be Presented but not Discussed

No. 686. "Foundry Education in Great Britain," by J. G. Pearce, M.Sc., M.I.E.E., F.Inst.P.

MR. PEARCE is well known as the Director of the British Cast Iron Research Association.

No. 687. "The Work of the Technical Committee," by J. W. Gardom (Convener, the Technical Committee of the Institute of British Foundrymen).

MR. GARDOM is a well-known consulting engineer.

No. 688. "Recommendations on Three Leaded Bronze Bearing Alloys," by the Non-Ferrous Sub-Committee of the Technical Committee of the Institute of British Foundrymen.

No. 690. "Industrial Legislation in South Africa," by A. H. Guy (presented on behalf of the South African Branch of the Institute of British Foundrymen).

MR. GUY is President of the South African Branch of the Institute and managing director of Eclipse Tube Liners, Limited, Benoni.

Our special Congress Number next week will contain a selection of the Papers presented at the earlier sessions in the week, whilst the remaining Papers, together with full reports of the discussions, will be published in subsequent issues of the Journal.

E. R. & F. Turner, Limited, Ipswich

(*Continued from page 475.*)

great extent is by no means a simple proposition. It is a matter which requires careful organisation, and it certainly speaks well that it has been accomplished without any adverse effect on the company's business.

The new shops are well laid out and equipped with modern machinery, but they are not yet, we understand, in their final form.

The Foundry

In the lay-out of the new works it was considered desirable, from many points of view, to house the roll and grey-iron foundries in one building. In other respects, however, they are operated entirely independently. The works sidings connect up with the main line at Ipswich so that the railborne material is delivered direct to the stocking ground adjacent to the furnace hoist. The melting plant consists of four cupolas, each of 4½-tons per hr. capacity; they are of the Thwaites "Rapid" type with drop-bottoms. A Roots blower supplies blast to each pair of cupolas. The cupolas are laid off in pairs for the chilled-roll foundry and the grey-iron foundry respectively, the charging platform being however common to the four.

The floor of the roll foundry is served by two cranes of 7-tons and 5-tons capacity respectively. The casting pit will take 20 moulds into which the metal is poured in the usual manner; it may, however, be noted that all rolls are cored, and on standard production rolls up to 3 tons in weight can be cast. The floor of the bay for grey-iron castings is served by two 5-ton cranes. The moulding equipment of this foundry includes six hand machines and two McNab, one Herman and one Zimmermann power machines. The total output of the chilled and grey iron foundry is about 60 tons per week, and of the grey iron castings manufactured about 90 per cent. are consumed on the works, by which is meant that they are used in connection with the firm's products. Cores are handmade, sand is prepared in a small paddle mill, and there are three coke-fired stoves. An August's mill and mixer is in service for the preparation of facing sand.

The melting plant in the non-ferrous foundry consists of a McNab coke-fired tilting furnace of 240-lbs. capacity and a stationary furnace of similar capacity by the same makers. In the fettling shop there are tumbling barrels, grinders and an installation of pneumatic tools. There is a well-equipped works laboratory, where routine work carried out covers the analysis of all raw materials, and periodic examination and testing of castings, whilst test-pieces are taken from all the rolls cast and examined for chill, etc.

The Post-Congress Tour of Britain

(*Continued from page 476.*)

tion of the Newcastle Branch of the Institute. The first works on the list is Sir W. G. Armstrong, Whitworth & Company (Ironfounders), Limited, a concern which does practically all its melting by the largest battery of pulverised fuel-fired furnaces in the world. These furnaces also make refined pig-iron for the open market. As British ironfoundry practice to-day operates under the strictest metallurgical control, the use of pig-iron of exact chemical composition has created a very important market for this commodity. Roll founding is also a feature at this works.

The three ironfoundries of the North Eastern Marine Engineering Company are characteristic of the best type of establishment devoted to the production of castings for ship propulsion. Here is retained the skill of the craftsman, supplemented by all the aid which the science of the metallurgist can give him. The machine shops, especially when full of work, are particularly impressive.

C. A. Parsons & Company are known all over the world as designers and builders of turbine sets and turbo-electric generators. They operate a modern foundry under strictly controlled conditions. Here also welding practice is seen at its best.

As "taking coals to Newcastle" is proverbial, it has been deemed wise to show the visitors something of the local coal industry. They are to see a modern battery of coke ovens making foundry coke at Priestman's Colliery and to inspect the subterranean workings of a modern coal pit belonging to the Wallsend & Hebburn Coal Company. The return to London on Friday, June 30, is to be made in the famous Coronation streamlined train, which averages 66 miles, or about 110 kilometres, per hour.

Facilities for Golf

Congress delegates or their ladies may have the inclination (and even the necessary amount of free time!) during the week to fit in a round of golf. With this in mind the organisers have made arrangements with the Broxbourne Golf Club, and through the courtesy of the Managing Committee of that club, the Broxbourne course will be available for the use of visitors to the Congress.

Broxbourne is a matter of only 15 miles or so north of Charing Cross, and is quickly reached by car. Alternatively at Marble Arch, a few minutes' walk from Congress headquarters, there is a 15-minute service of Green Line coaches (Route M) which stop outside the Club House at Broxbourne, the journey by this means taking about an hour. As for the course itself, it is delightfully situated, varied in character and excellently kept.

Those who wish to make use of it are asked to make contact with either Mr. H. W. Lockwood or Mr. F. Arnold Wilson at the Registration Office and Information Bureau at the Congress headquarters, the Dorchester Hotel.

Annual Cricket Match

Whilst on the matter of sport, overseas visitors may be interested to know that the Annual Cricket Match between the Institute of British Foundrymen and the Works Management Association will be held on Sunday, June 25, in Hereford, at the sports ground of the Bulmer Cider Company. Members of the Institute who intend to participate should communicate with the organiser, Mr. J. E. Hurst.

Some Jobbing Problems

By F. G. JACKSON

(*Concluded from page* 441.)

An Experiment in Magnetism

The author went over to the machine shops to see the feeder heads removed, the object being really to point out to the operator that he should be careful not to get a splinter in his eyes as the magnet would be useless on non-magnetic material. While trying the magnet on the borings it was noticed that they were slightly magnetic. While not yielding to magnetism like steel or iron, the turnings would definitely pick up. The tool was tried and found to be magnetic, and it was thought that was the answer. Later, not feeling satisfied, the author tried other tools after other operations. These tools were non-magnetic and the borings were magnetic. A test-bar was then placed on a magnetic chuck, and it could be rolled about the chuck without being attracted at all. The turnings from the test-bar were placed on and they moved to the magnets immediately.

The author has since learned that this is due to the breakdown of the molecular structure.

One other remarkable feature about the metal is the surface hardening. In the first place an effort was made to remove the feeder heads by hacksaw. Good-quality saws were ruined after being passed over half a dozen times, yet machinability was good. When the outer skin was removed it was quite easily sawn. Initially the author expected considerable trouble with the metal, and it was successfully avoided. Whether the precautions were justified or whether the metal is easy to work can be left to those best qualified to judge. Incidentally, in a jacketed cover, studs must be used to secure the core. In this case studs made of the same material, Ni-Resist, were turned out of the runners of the previous castings. Steel studs would have a very short life with certain types of acid, and the expense of making Ni-Resist studs will undoubtedly be justified by longer service.

Capstan Boxes

A capstan box with worm box cast on is an interesting type of casting. The general thickness is $\frac{5}{8}$ in.; the size is 7 ft. 6 in. by 4 ft. by 3 ft. 2 in. deep at the deep end, whilst the shallow end is 1 ft. 6 in. deep. At that end are two prints. The pattern for this was freshly made, but before the job was started in the foundry an order was received for a casting exactly like this one, but 4 in. shallower, and the same pattern had to be used.

Now this is a problem which is difficult to surmount if it is the first time it has arisen in a casting of this nature. Many suggestions were made and rejected before the correct method was found. The final methods of manufacture are illustrated in Figs. 10 to 15.

The first thing to do is to find the thickness of the lower middle part. This was 12 in.; therefore, a line was drawn 12 in. above the bottom joint. The prints were sawn in two, 4 in. above this line, and the lower half dropped 4 in. This left a 4 in. gap, the bottom of the gap being level with the top of the lower middle part. The lower middle was gaggered and rammed up, a joint was made here and a 4-in. wooden middle part placed on and rammed up with floor sand. The upper middle part was then gaggered and rammed up, as was the top part. The top part was lifted off and then the complete middle part. The upper middle was lifted off, the wooden frame removed, and the upper middle part placed on the lower, and the joint dressed off. The prints then formed a whole again and the mould was 4 in. shallower.

The core boxes were reduced by putting 4-in. blocks in the bottom.

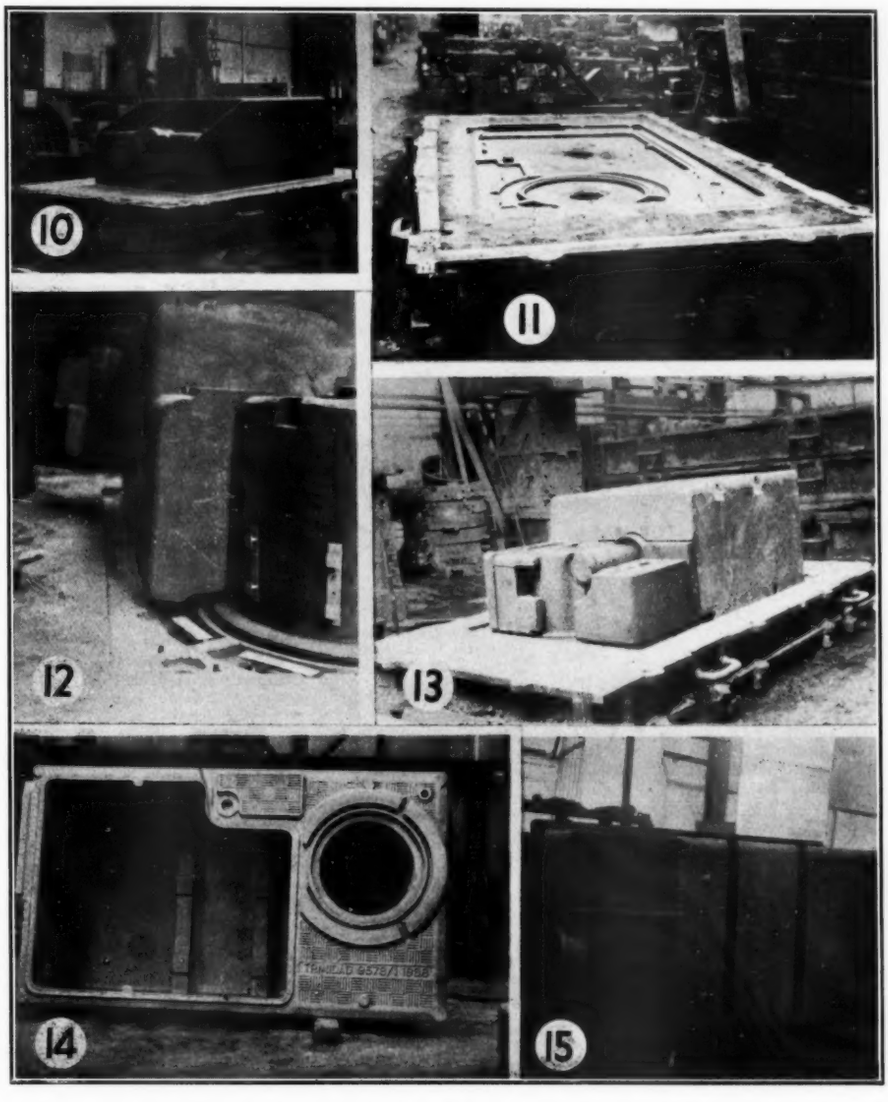
Iron Moulds

Some time ago a Paper on "Iron Moulds" dealt with the production of air turbine rotors in iron moulds. The rotor was cylindrical in shape, with a fairly large hole through the centre. No top part was used, and a cast-iron mould formed the outside and a high-carbon steel mandril was used for the core.

The method of casting was to allow the metal to cool to a certain temperature and then pour directly and as quickly as possible into the mould. When set, the iron mould was tipped on its trunnions and the casting allowed to fall out. The steel centre was knocked out.

The value of this method as a labour-saver can easily be appreciated; moreover, the fact that cooling is greatly accelerated and a hard dense structure produced, means that inferior irons can be used and still be as strong as high-quality iron cast in sand. Another important factor was that rod-feeding was eliminated. The author of the Paper claimed for this method a higher percentage of good castings.

This idea is fundamentally an extension of the densening system. Instead of local densening there is a general densening. Being impressed by the possibilities of the system, the author sought for any job lending itself to production in iron moulds. There was one job, shown in Figs. 16 and 17, free from machining, but which had to fall within ± 3 lbs., the gross weight being 84 lbs.; therefore, it had to be within 81 and 87 lbs. The diameter was important, having to pass through a ring gauge 1 ft. 6 in. dia. The most important feature was a steel eye which could actually be fitted in four different positions. The depth of the eye portion outside the casting had to be to gauge. These jobs with 300 to 400 off were a nuisance. If rammed soft, they were too big; then the eye would be put in the print the wrong way. The depth of the eye in the sand print would vary. The worst feature was that the plummets had to be fed, and even if cast with dull iron, kept open quite a while. The iron mould system was therefore applied. The trouble was to decide how to run it; it would not answer to run on iron, as the runner would freeze and not allow the casting to be fed, either with or without a rod. Therefore, a small core was fitted in the top.



FIGS. 10 TO 15.—STAGES IN THE MANUFACTURE OF CAPSTAN BOXES.

In the first place, the bushes or runner basins were weighted down, but as this was rather cumbersome, two bolts were fitted with springs and clips. Initially a coating of plumbago and oil was used, but it caused gasholes at the top of the castings. Blacking applied by spray gun was next tried, and found to be highly satisfactory. A very interesting thing occurring on these iron moulds is that, after the mould has been cast about 1½ min., the metal begins to flow up the runner and freeze until the top of the runner is almost hemispherical. This is probably due to two causes: the rapid contraction of the outside of the casting forcing the metal up through the runner, and the expansion of the carbon when separating out as graphite on reaching a point between liquid and solid.

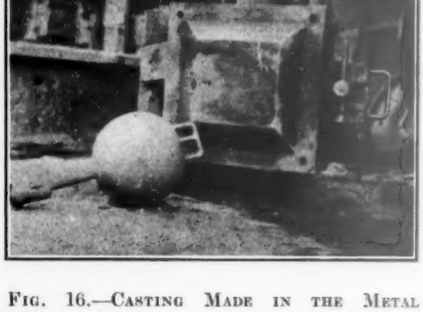


Fig. 16.—Casting Made in the Metal Mould (shown closed in background).

One of the most important points is the accuracy of the eye. This cannot now be fitted wrongly and is always in exactly the same place. The cores do not cost more than a penny. Closing can be done by a labourer or apprentice, and the cost is negligible.

Columns

In Fig. 18 is shown a water column or water crane, used on the railways for filling engine boilers. It is interesting because of its length, which attains 22 ft. The methods of casting, drying and securing the core all present features of interest. Fig. 18 shows a 15 ft. column alongside a 22 ft. one. The large base, 4 ft. by 3 ft. 6 in., is noteworthy. Fig. 19 shows one of the columns in casting position on a bank. This is done to bring each end of the casting to a level mark. This mould was rammed up in green sand, skin dried by a modern mould-drier in 1¼ to 1½ hours, the coke consumption being under 1 cwt. The same type of core bar as illustrated in connection with hydraulic work was used on this job, only both ends were open. Only 1¼ in. of straw and loam was allowed at the small end. The core was secured by three ⅜-in. steel stems, which passed through the thickness of core to rest on the core bar (see Figs. 20 and 21).

The casting was poured from the centre and also from the foot, two ladles being used. Pouring was started in the foot with very dull metal, and when the metal reached the body, pouring was commenced in the centre from the main ladle with hot metal.

that pressure was set up in the vents, and the gases took the line of least resistance, breaking the cores.

Mr. Richardson said his foundry cast the pumps in steel at 1,650 deg. C. and at a fairly fast rate.

Ni-Resist Castings

Mr. John Williams, jun., asked whether the finish of Ni-resist castings was inclined to be rough.

Fig. 17.—Metal Mould (Open) and Two Castings Produced therefrom.

Mr. Jackson thought that there was a tendency to roughness on iron castings alloyed with fairly high percentages of nickel, probably due to the fact that the metal was inclined to drag and follow the tool. The metal was tapped and taken straight to the mould and poured; he did

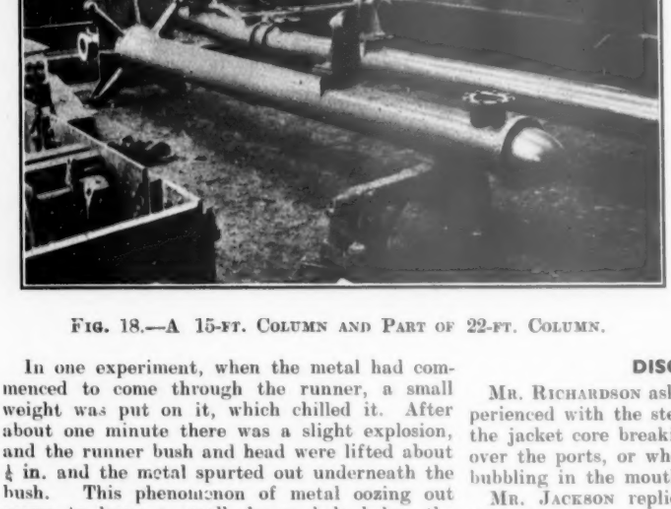


Fig. 18.—A 15-ft. Column and Part of 22-ft. Column.

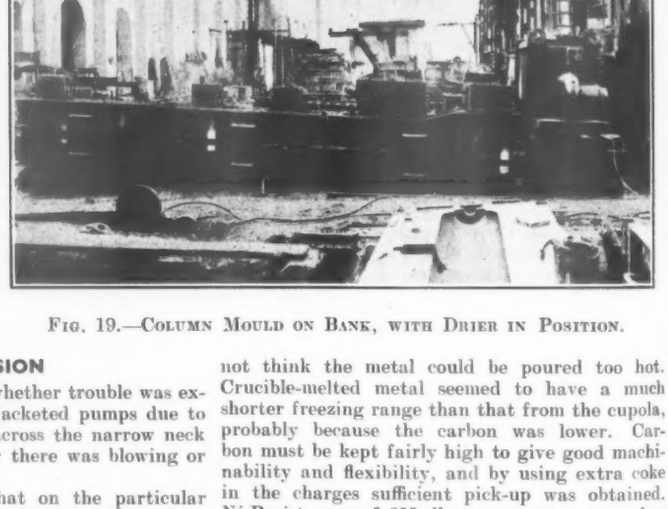


Fig. 19.—Column Mould on Bank, with Drier in Position.

In one experiment, when the metal had commenced to come through the runner, a small weight was put on it, which chilled it. After about one minute there was a slight explosion, and the runner bush and head were lifted about ¼ in. and the metal spurted out underneath the bush. This phenomenon of metal oozing out seems to leave a small drawn hole below the runner. To counteract this, some slight feeding is practised, and when the casting is solid under the rod, it is safe enough to open the mould and allow the casting to drop out. The dust is brushed out and the mould sprayed, closed and cottered. The runner core is put in position with the bush on top and the clips are fitted, when the mould is ready for pouring.

As in the other case, the metal is poured as fast as possible at about 1,200 deg. C. The time between pouring and knocking out is approximately five minutes, if the metal has an analysis of C 3.4, Si 1.8 to 2.0 and P 0.60 per cent. With lower carbon, phosphorus and silicon, quicker cooling takes place. This particular mould has had about sixty castings produced in it, and there appears to be no reason why it should not serve for 300 to 400.

DISCUSSION

Mr. Richardson asked whether trouble was experienced with the steam-jacketed pumps due to the jacket core breaking across the narrow neck over the ports, or whether there was blowing or bubbling in the mouth.

Mr. Jackson replied that on the particular type there was no such trouble, but types which had a shrouded jacket core did at times show defects. The pumps were cast hot and fairly slowly to allow the gases to escape freely. Fast pouring caused the gas to generate so quickly

Fig. 20.

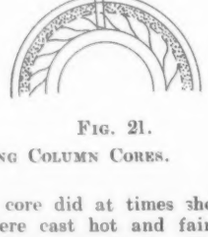


Fig. 21.

Method of Seating Column Cores.

not think the metal could be poured too hot. Crucible-melted metal seemed to have a much shorter freezing range than that from the cupola, probably because the carbon was lower. Carbon must be kept fairly high to give good machinability and flexibility, and by using extra coke in the charges sufficient pick-up was obtained. Ni-Resist gave 1,300 lbs. on a transverse bar ⅞ in. in diameter set at 12 in. centres.

Mr. Richardson asked what metal was used for the dies for receiving iron.

Mr. Jackson said he used a cold-blast iron with a silicon content of 1.4 per cent. After 50 or 60 castings had been made, there was a certain amount of crazing. Hematite was a very good iron for this class of work, and usually the blocks used for chill castings were made from it. The departure from ordinary hematite to cold-blast iron was made as an experiment, and the results seemed to be in favour of the latter. The life of a die or block of this nature seemed to depend upon its early treatment. If it was well warmed up and a good coat of blacking put on before casting started, it would certainly last longer than if the metal was poured in a cold, unprepared mould.

Properties of Quenching Oils

CRITERIA FOR EFFECTIVE TREATMENT

The Second Report of the Alloy Steels Research Committee, which was presented to the recent Annual Meeting of the Iron and Steel Institute, in London, contains a contribution (Section IX, Part 5) on "The Properties of Quenching Oils," by MR. J. A. JONES and MR. W. W. STEVENSON. The Paper describes tests and laboratory examination on seven commercial quenching media and notes on their values are given. Some extracts from the Paper are appended.

Practically all types of oils have been tried at some time or other for the quenching of steel. The sources of supply are numerous, and the oils used may be said to fall into two main classes:—(1) Mineral oils, which are complex hydrocarbons; (2) fixed or fatty oils, which are all glycerides, with the exception of sperm oil and wool grease. Sperm oil is an ester of cetyl alcohol, whilst wool grease is an indefinite mixture of organic complexes. Mineral oils vary in their properties according to their origin and the method of refining, and the "quality" or "stability" of a mineral quenching oil may be largely summed up in its volatility, resistance to oxidation, sludging and tendency to decompose. The desired stability is attained by careful selection of the crude and attention to refining methods. For ordinary oils after distillation, refining may only consist of acid treatment followed by alkali and refining earth treatment. The most stable oils produced in present-day practice, however, such as the high-grade lubricants, are obtained by one of the solvent extraction methods, whereby the more oxidisable portion of the oil is removed.

The fatty oils may be subdivided under three further headings:—(1) Fish oils and marine animal oils; (2) land animal oils; (3) vegetable and seed oils. From the viewpoint of quenching, a further class of oils should be included, namely, compounded oils, which usually consist of a mineral-oil base with which are blended varying proportions of fatty oil.

All these oils have their advantages and disadvantages when used as quenching media; the straight mineral oils boil over a range of temperature and hence tend to lose the "light ends" by volatilisation with continued use, whereas the animal and vegetable oils are very prone to oxidation, with consequent increase in viscosity and the formation of sludge. Both forms of breakdown result in ultimate inefficient quenching capability.

Seven commercial quenching oils have been examined in the condition as received from the supplier, whilst in two cases "used" oil was available for comparison and has also been examined. All the oils were supplied by members of the Committee and they may be regarded as a typical series of quenching media as used in the steel industry in the Sheffield district.

The various chemical and physical tests which have been carried out are given below, together with a brief note on the method of test.

(1) *Saponification Value* is the number of milligrammes of potassium hydroxide required for the complete saponification of 1 grm. of the oil. A weighed quantity of the oil is refluxed with a known quantity of standard alcoholic potassium-hydroxide solution until saponification is complete, after which the excess alkali is titrated with standard acid, using phenolphthalein as indicator. In a refined mineral oil the saponifiable matter present is practically negligible, but the fatty oils have a high saponification value. In compounded oils, therefore, the content of saponifiable matter is an indication of the amount of fatty oil present.

(2) *Acid Value* is the number of milligrammes of potassium hydroxide required to neutralise the free fatty or petroleum acids present in 1 grm. of the oil. A weighed quantity of the oil is shaken with warm ethyl alcohol and is titrated with standard sodium or potassium-hydroxide solution, using phenolphthalein as indicator.

New samples of mineral and animal oils contain practically no free fatty acid, whilst vegetable oils contain only a small amount, but the content increases with time of standing and by oxidation. The acid value of an oil is therefore an indication of quality and age.

(3) *Iodine Value* is the percentage of iodine monochloride which is absorbed by an oil, expressed in terms of iodine. A weighed quantity of the oil is dissolved in carbon tetrachloride and treated with a known quantity of a chlorinated solution of iodine in acetic acid. The iodine present in the solution is determined by titration with standard sodium-thiosulphate solution, using starch as indicator.

The iodine value is a measure of the unsaturated aliphatic compounds present and depends on the fact that these compounds are capable of forming additive compounds with the halogen elements. The iodine value is a constant quantity for any particular oil, but varies with different types of fatty substances. The value does not alter materially with the age of an oil unless definite chemical changes have occurred, and hence it is very useful as a means of identification of oils.

(4) *Flash Point* is the temperature at which the vapours given off by a known volume of oil ignite momentarily when brought into contact with a flame. The open flash point is determined by the Air Ministry method, which specifies that the test be carried out in a brass cylindrical vessel, 4 cm. high and 4 cm. in dia., filled with oil to a depth of 3 cm. A thermometer is inserted in the oil and the whole is heated on a sand-bath (using the thermometer as stirrer) so that the temperature increases at the rate of 9 deg. Fah. (5 deg. C.) per min. The temperature when a distinct flash occurs is taken as the flash point. The closed flash points reported have been determined in the Pensky-Marten apparatus, which consists essentially of a closed metal container in which the oil is slowly heated. The cover of the container has a small shutter that is opened at intervals by a mechanical device, which simultaneously directs a small flame into the oil vapour. The temperature at which a definite flash is obtained across the surface of the oil is taken as the flash point.

As would be expected from the nature of the two types of test, the open flash point is usually about 20-30 deg. Fah. higher than the closed flash point on account of the concentration of vapour in the latter test. The main value of a flash-point specification in connection with quenching oils is to ensure a sufficiently high figure to avert the possibility of oil fires, as a low flash point indicates the presence of light fractions.

(5) *Specific Gravity* requires no definition, as regards either the actual property or the method of carrying out the determination. It is, to some extent, an indication of the origin of an oil, but it bears very little relationship to the viscosity. It is of interest in regard to the purchase of oils, in that the lower the specific gravity the greater is the volume of oil obtained per ton. It has been included in the present work mainly for the sake of completeness.

(6) *Viscosity* is the "body" or fluidity of an oil and is measured in the laboratory by noting the time taken for a given volume of the oil at a fixed temperature to flow through a standard orifice. The Redwood viscosity of an oil is the number of seconds required to pass 50 ml. of the oil through the orifice of the Redwood viscometer. As the viscosity of oils falls with rising temperature, viscosity measurements are taken over a range of temperature to determine the nature of the viscosity curve.

The kinematic viscosity is the value obtained when the coefficient of viscosity (μ) in poises is divided by the density (d) in grms. per ml. The coefficient of viscosity of a fluid is the numerical value of the tangential force on unit area of two parallel planes at unit distance apart, when the space between the planes is filled with the fluid in question and one of the planes moves with unit velocity in its own plane relative to the other.

The value of viscosity figures for quenching oils lies in the fact that the viscosity determines very largely the speed with which convection currents can be set up in the quenching bath, *i.e.*, the rapidity of replacement by cold oil of the hot oil immediately adjacent to the hot steel. The thinner the oil the greater is the movement in the oil bath; also, the "carrying-away" loss of oil on the quenched steel is determined by the viscosity of the oil. On the other hand, very thin oils are automatically associated with high vaporisation during quenching, with consequent rapid deterioration.

(7) *Volatility*, or loss by evaporation, is expressed as the percentage loss obtained when a known weight of oil is heated under standard conditions. The results reported have been obtained by the following method, devised by B. W. Methley: 15-20 grms. of oil are placed in an open 2¼-in. dia. porcelain crucible, which is directly heated by a Bunsen flame. The oil temperature is maintained at 200 deg. C. for 2 hrs. and the loss in weight is determined.

This test was devised with particular reference to quenching oils, in order to simulate in the laboratory the hot-spot effects in the quenching of steel.

The volatility of quenching oils should be as low as possible, as oils with a high content of volatile fractions will show high losses in use, with automatic thickening of the oil. The uniformity of quench is also affected, owing to gas formation at the commencement of the quenching operation.

(8) *Tendency to Sludge* (*B.S.S.* 148—1933) is measured by maintaining a definite quantity of the oil (100 grms.) at 150 deg. C. in contact with a copper catalyst for 45 hrs. and passing purified air through the oil at a fixed rate of 0.07 cub. ft. per hr. The oil is then extracted in petroleum spirit, allowed to stand for 16 to 24 hrs. and filtered, the residue being dried and weighed. The sludge is calculated to, and reported as, a percentage of the oil.

The sludging test was devised originally for measuring the tendency to sludge of turbine oils, but the value is of interest in the comparison of other types of oil as a relative measure of the separation of solid matter under fixed conditions of test. In connection with quenching oils, the formation of sludge with continued use of the bath will tend to alter the speed of quenching the steel.

Whereas the "tendency to sludge" test may, in general, be relied on to give an indication of what may be expected in use, the figures are not capable of strictly mathematical interpretation.

(9) *The Air Ministry Oxidation Test* is a modification of the sludging test, and consists of passing air at the rate of 15 litres per hr. for two periods of 6 hrs. on consecutive days through 40 ml. of oil contained in a boiling tube; the latter is supported in an oil-bath maintained at 200 ± 1 deg. C. during the test. Ramsbottom coke number and viscosity determinations are carried out before and after oxidation, in order to obtain the increase in the coke number and the ratio of the viscosities.

The oxidation test, therefore, is an empirical method of determining the tendency of an oil

to thicken and to form sludge deposits. Both these factors are of importance in quenching oils in relation to their effect on the alteration of the speed of quenching with the age of the quenching bath.

(10) *The Ramsbottom Coke Number* is the percentage of carbon residue obtained when the oil is ignited under carefuily-controlled standard conditions. A glass bulb of fixed dimensions, drawn out to a capillary at the top, is used; it contains 3.75 to 4.25 grms. of oil, and is heated in a metal sheath immersed in a liquid metal bath at 550 ± 5 deg. C. The bulb is allowed to remain in the bath for a fixed length of time, after which it is reweighed and the carbon residue is determined.

The Ramsbottom coke number gives an indication of the carbonaceous residue that may be expected in practice on complete decomposition of the oil in the absence of air. The test is carried out before and after the Air Ministry oxidation test as a guide to the rate of deterioration of the oil in use.

(11) *Specific Heat* at any given temperature is usually defined as the quantity of heat required to raise the temperature of a unit mass of the oil through 1 deg. C.

The specific heat is one of the factors which influence the rapidity with which an oil becomes heated, and in the temperature range 0 to 100 deg. C. is usually of the order of 0.4 to 0.5 c.g.s. units.

(12) *Thermal Conductivity* is the quantity of heat which is transferred per unit time through a unit cube for 1 deg. C. difference in temperature between two of its opposite faces.

The thermal conductivity influences the rate of dissipation of heat which is applied to the oil.

The "Sandontap" System of Moulding

In our issue of March 30 we gave the first published intimation of a new system of sand-conveying and mould making which offers new possibilities in the lay-out and methods used in foundries. Development of the process has covered a period of three years, and the results obtained are interesting.

The plant consists of a machine, for convenience called a generator (see Fig. 1), in which moulding sand is mixed with compressed air, and from which it travels along ordinary steel tube to the moulding station. The equipment there is an articulated tubular arm which flexibly holds the delivery end of the sand-conveying tube (see Fig. 2), and by which the moulder directs the stream of sand into the moulding box. To mould, the delivery end of the sand pipe is simply moved horizontally over the box till the stream of sand has filled it. The sand enters the boxes at a speed and under conditions which produce half-moulds as uniformly hard along the sides of the deepest lifts as on horizontal surfaces, and of somewhat unusual permeability.

Attempts were made in the past, notably in Germany, to convey clay-bonded sand along pipes to moulds. A volume of air was stated to be employed which is five to fifteen times that used by the present process, but it is not known that useful results were obtained. The sand used for the work now to be described was taken from the normal flow out of a sand-conditioning plant which treated some tens of tons of sand per hr. The sand was the same, both in composition and moisture content, as that used in a variety of jolting and squeezing machines in the foundry.

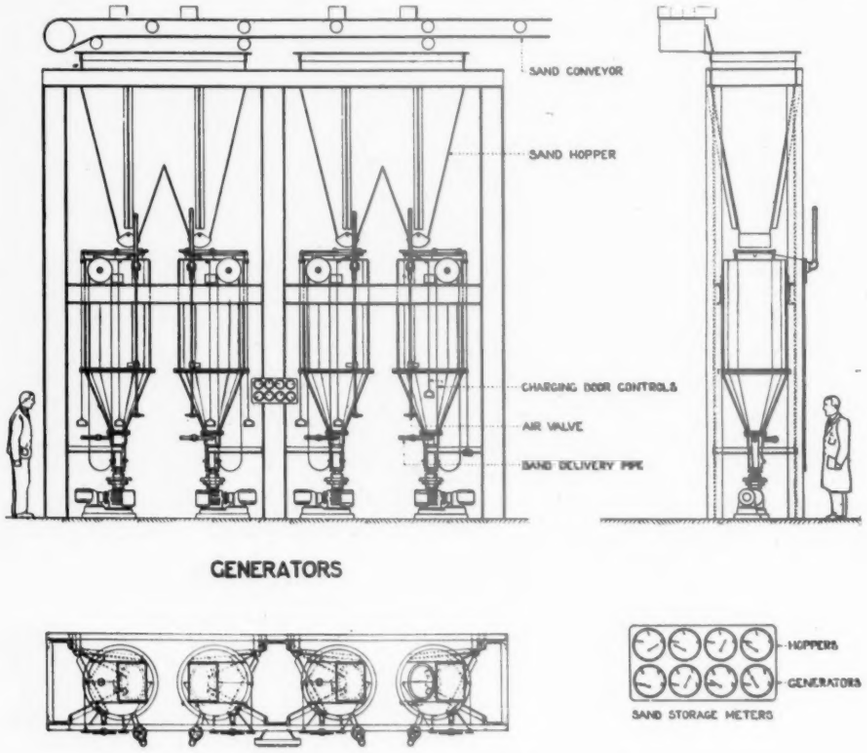


FIG. 1.—ARRANGEMENT OF SANDONTAP MOULDING SYSTEM.

The moulding boxes and patterns required for the process are of any ordinary type and are assembled in easy manner as there is no jarring to be provided against. If it be desired to place gaggers or other irons in the sand, this is done as in hand-moulding, the sand stream being temporarily stopped, if required, for the purpose. Even should several minutes elapse between shutting off the sand stream and starting it again on the same mould, no cleavage is traceable between the early and later filling. The stripping of the moulds follows normal practice.

Whilst the sand is travelling along the pipe to the moulding station, the particles of sand are minutely separated from each other by the expansion of the compressed air contained between the grains. When the intense "rain" of separated sand emerges from the delivery nozzle and beds itself in the moulding box, it produces a mould containing a complex matrix of minute air channels within the sand. This is the reverse of what happens in earlier moulding practice, as sand is usually aerated prior to such moulding, and then forcibly de-aerated by the shock of jolting or the high-tonnage pressure of squeezing.

High Permeability Yielded

When the finished mould is poured, its permeability sometimes causes a mass of tiny gas flames to cover the top surface, giving the appearance of a Christmas pudding on fire. This unusual permeability might be thought to cause a poor skin, but it has been authoritatively stated that the skin on the castings is equal to the best previously produced. From examination it would appear that, during the "growth" of a mould, the sand can flow sideward as well as downward on arriving in the box. This may explain why the new method produces similar hardness of sand on vertical surfaces as on horizontal ones, and why sharp corners on a pattern are just as sharp in the casting.

The equipment can be used for all types and sizes of moulds. The articulated arms at the moulding station cover a large moulding area, but they occupy little floor space. The articulated arms are not an obligatory part of an installation, and the arrangement at the moulding end can be modified to provide what the foundryman considers best for his particular moulding requirements. The most convenient lay-out of the plant is to instal the "Sandontap" generator or generators in a bay parallel with and next to the moulding bay, or between two such bays, and to run the sand main or mains lengthwise along the latter; the supply to each operator can then be branched off at the nearest point to his moulding station. In a new foundry lay-out, the sand-conditioning plant would probably be best near to, and in the same bay as, the generators. This method of moulding frees the moulding bay from overhead hoppers, conveyors and their supporting structures, so an overhead crane can serve the entire floor.

Sand has been delivered successfully through 10 ft. of 1½-in. dia. pipe connected, by reducing socket, to a 50-ft. length of 1-in. dia., and the emerging sand produced moulds as excellently as with shorter lengths of pipe. It is believed that longer lengths could be used if desired. The wear and tear of the piping is negligible, which follows from the ease with which the sand travels through it. A further indication of the small friction present is that the speed at which the sand leaves the piping varies little whether this latter is 10 ft. or 60 ft. long. There is high probability that the sand travels forward in the pipe surrounded by air acting as an almost frictionless envelope. The air consumption for the process has not yet been measured definitely, but it appears to be in the region of 225 cub. ft. of free air per ton of sand. The pressure required is 70 to 90 lbs., dependent on the green strength of the sand.

Core-Making

The system is also applicable to the moulding of cores in large core shops. Special core-boxes are not necessary, however, as for core blowing, and both oil- and clay-bonded sand can be used. An interesting incidental item of the equipment, which has a general use in foundries, is the apparatus for indicating the height of the sand

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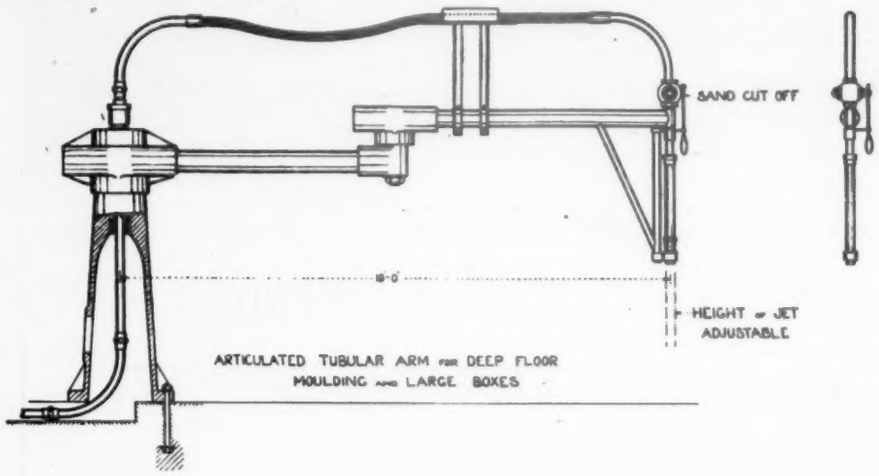
in hoppers or bunkers. In the present case it is used on both the "Sandontap" generators and their feeding hoppers. The height-indicating meters, which can be seen in the centre of Fig. 1, are electrically operated and, if desired, the same current can work automatic controllers or alarms for any purpose connected with the regulation of the sand supply. The meters may be near hoppers or in a distant reading place. Permanent records of the amount of sand stored at all times of the day can be charted automatically if desired.

We are indebted to the Sandontap Company, of Dunston House, Harrogate, for a description of the equipment, which, we understand, is covered by British and foreign patents.



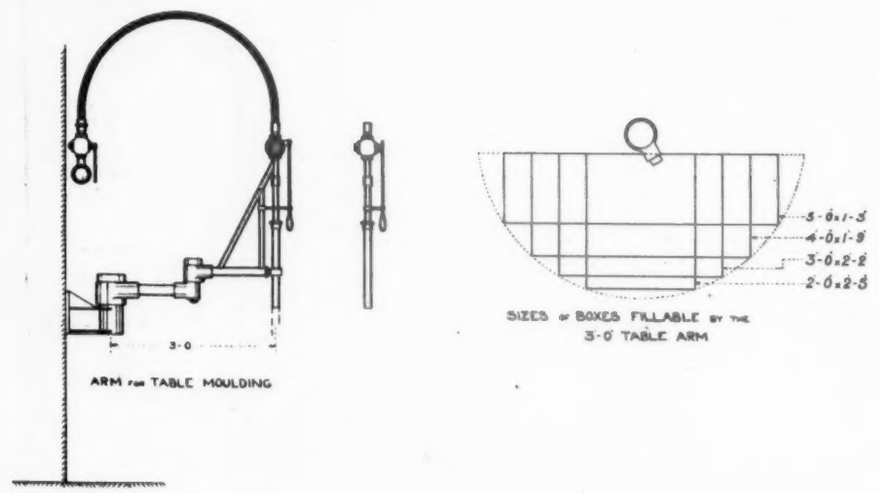


FIG. 2.—ARTICULATED ARM FOR FLOOR MOULDING AND ARM FOR TABLE MOULDING.

Bessemer Flame Control

USE OF SELENIUM CELL

The Jones & Laughlin Steel Corporation, of Pittsburgh, claim to be the first steel producer to apply scientific control to the manufacture of Bessemer steel. Recently they have made application for patent rights covering a method for making use of the photo-electric cell equipment in the operation of its Bessemer converters.

The new method, known as the "Bessemer Flame Control," has proved highly successful in achieving uniformity of quality in Bessemer steel. This precision control has an arrangement of photo-electric cells as the actuating element. In conjunction with the cells, and as a part of the control system, a complete instrument panel provides accurate regulation of blowing conditions. Until now, control of the Bessemer converter depended upon the skill of the blower, who had sole responsibility in determining the proper "end point" or termination of the blow, which has a definite connection with quality results. The object of the research was to supplement the acuteness of the human eye with an invariable method that would not be affected by fatigue, inattention, poor physical condition or other variables which affect the most skilled workman.

It is believed that the application of this method will develop new applications for Bessemer steels where uniform high-quality steel is required. The "Bessemer Flame Control" promises strong support to the economic and commercial value of the Bessemer process, and may influence the ultimate direction of steel-making procedure.

A. B. BOFORS, the Swedish armament firm, is working to capacity, the value of orders on hand at 242 million cr., against 166 million cr. a year ago, affording full-time operations for three years, in spite of substantial extensions to plant. Last year deliveries totalled a value of 91,000,000 cr., against 51,000,000 cr. in 1937. The net profit was 9,100,000 cr., against 5,300,000 cr. in 1937. A dividend of 11 per cent. is being paid.

Malleablising

The short-cycle annealing of malleable iron is discussed in an article in a recent issue of "Metals and Alloys," which points out that ten years ago, standard American malleable production methods consisted generally of placing the charges in scale- or ore-filled pots, covering, heating to around 1,600 deg. Fah. in 30 to 40 hrs., soaking there at 50 to 65 hrs., cooling to about 1,200 deg. Fah. for 80 to 90 hrs., and finally rapidly cooling to 600 deg. Fah. before discharging. A total time cycle of 200 hrs. was therefore not at all unusual.

Speeding up the malleablising operation so as to bring it more in line with production advances in other processes had to be accomplished with no important sacrifice of the traditional quality of American malleable—good machinability, elongation around 20 per cent., tensile strength over 50,000 lbs. per sq. in., characteristic shock-resistance, etc. Modern fully-annealed short-cycle malleable is not at all inferior to the conventional product; shortening of the cycle to its present period of 12 to 50 hrs. has been accomplished by raising the annealing (soaking) temperature, by using lower carbon and higher silicon contents to hasten graphitisation, and by employing controlled atmospheres instead of oxide-packings, to permit a higher net metal percentage in the furnace charge; the frequent use of continuous equipment has also aided in shortening the cycle.

This all applies to the production of fully-annealed malleable, *i.e.*, iron whose microstructure is substantially temper carbon in ferrite, with no cementite, pearlite or sorbite evident. The new "pearlitic malleables" are also annealed in extremely short cycles, but their properties—better in some respects, poorer in others—are quite different.

Patent Specifications Accepted

The following list of Patent Specifications accepted has been taken from the "Official Journal (Patents)." Printed copies of the full Specifications are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. each. The numbers given are those under which the Specifications will be printed and abridged, and all subsequent proceedings will be taken.

502,233. SOKAL, S. (Maschinenbau-Akt.-Ges. vorm. Ehrhardt & Sehmer). Sheet-levelling machines.
502,295. CLIMAX MOLYBDENUM COMPANY. Alloying molybdenum and more particularly for introducing molybdenum into iron or steel.
502,456. KRUPP GRUSONWERK AKT.-GES., F. Rolling-mills.
502,492. CLEVER, O. Method and apparatus for straightening pipes, rods, and bars of any profile.
502,496. COWDREY, C. L. Pipe joints.
502,500. TAIT, W. H. Electromagnetic measuring device.
502,513. METALLGES AKT.-GES. Band sintering or roasting apparatus.
502,514-5. KRUPP AKT.-GES., F. High-speed steel.
502,543. CHUBB, W. F. Control of atmosphere in furnaces.
502,617. BIRMINGHAM ELECTRIC FURNACES, LIMITED. LOBLEY, A. G., and KERFOOT, F. Furnaces of the conveyor-belt type for the continuous heat-treatment of materials.
502,683. BALLARD, W. E., RAPID MAGNETTING MACHINE COMPANY, LIMITED, and HUTTER, H. E. Apparatus for preparing or cleaning surfaces by directing finely divided substances thereon.
502,756. SOC. DES ACIERIES DE LONGWY, and QUINCY, L. Manufacture of rolling-mill rolls.
502,779. DURENER METALLWERKE AKT.-GES. Means for increasing the strength values of metal sections.
502,828. DORIN, A. Machine tools for machining work of non-circular cross-section, more particularly ingots.

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● Typical Cylinder Pig Iron Specification

TOTAL CARBON	2·70%
SILICON	1·80%
MANGANESE	·90%
SULPHUR	·06%
PHOSPHORUS	·40%

● Typical Malleable Pig Iron Specification

TOTAL CARBON	2·60%
SILICON	·75%
MANGANESE	·50%
SULPHUR	·05%
PHOSPHORUS	·06%

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The Week's News in Brief

Trade Talk

THE ANNUAL MEETING of the Belgian Foundry Technical Association will be held in Liége tomorrow (Friday).

A BOILER EXPLODED at the brass foundry of Vickers-Armstrongs, Limited, Newcastle-upon-Tyne, and although some damage was done, no one was seriously injured.

THE ANNUAL CONFERENCE of the Society of Chemical Industry is to be held under the patronage of H.M. the King at the University College of the South West, Exeter, from July 10 to 15.

A 5,000-TON EXTRUSION PRESS has begun operation at the Banbury Works of the Northern Aluminium Company, Limited. It is one of the biggest of its type in the world and is capable of extruding billets to a maximum weight of nearly half a ton, and maximum cross-section diameter in the region of 16 in.

ROLLS-ROYCE, LIMITED, have just opened temporary factories at Hillington for sub-contracts. A depôt has also been leased to test all work carried out by Scottish contractors before being sent to the main works for assembly. Offices will also be established at Hillington and Glasgow for clerical and administrative services.

THE POPULARITY of the high-speed floor grinding machines of F. E. Rowland & Company, Limited, of Climax Works, Reddish, near Stockport, in the South of England is exemplified by the fact that their machines are to be found in all—except one—of the plants to be visited during the International Foundry Congress in London next week.

IT IS STATED that negotiations are almost completed for the acquirement of the site of old fuel works on the wharf side of Port Talbot docks by Metallurgical Industries, Limited, London. It is proposed to erect an aluminium melting furnace to be operated in conjunction with a metal-recovery factory being erected on the opposite side of the dock.

A LEAFLET on the Civil Defence Bill as it affects owner and occupiers of commercial and industrial establishments, such as foundries, was recently issued from the Lord Privy Seal's Office. The Bill is being amended in certain respects during its passage through Parliament, and a further leaflet summarising and explaining any such amendments will be issued as soon as the Bill becomes law.

HAUTS-FOURNEAUX DE SAULNES (Jean Raty et Cie), Longwy, the French iron and steel works concern, reports a profit of 19,032,707 fcs. for 1938, an increase of 1,962,511 fcs. on the profit of 1937. A dividend of 50 fcs. per share has been declared. The Saulnes and Hussigny furnaces produced 122,961 tons of pig-iron in 1938, against 170,852 tons in 1937, furnaces at Hussigny being out of blast from March, 1938, owing to slack trade. Iron-ore output at Sancy declined by 252,000 tons to 739,551 tons, the lowest figure since 1923.

AN ARRANGEMENT has been concluded whereby Johnson, Matthey & Company, Limited, have acquired a controlling interest in Mallory Metallurgical Products, Limited, and the offices of this company have been removed to those of Johnson, Matthey & Company, Limited, 78, Hatton Garden, E.C.1. A new factory is being erected at Wembley for the production of the Mallory range of Elkonites and copper alloys, and it is intended to develop the sales and service organisation in conjunction with Johnson, Matthey & Company. Mr. S. S. Moore Ede and Mr. A. B. Coussmaker, directors of the latter company, have joined the board of Mallory Metallurgical Products, and Dr. L. B. Hunt continues to act as technical manager of the company.

AT the Redbourn steelworks of Richard Thomas & Company, Limited, Scunthorpe, a new blast furnace with a capacity of 1,500 tons of pig-iron per week has been blown in. The ceremony of lighting-up was performed by Miss Irene Kilby, daughter of Mr. J. N. Kilby, general manager of the works. The equipment includes two new hot-blast stoves, and a blast-furnace gas-cleaning plant, this having been supplied by Ashmore, Benson Pease & Company, Limited. The second of two Becker coke-oven batteries, each consisting of 41 ovens, is being put into commission, while a high-pressure water-tube boiler by Simon-Carves & Company, Limited, has been installed. The gas main from the blast furnace to the gas-cleaning plant was supplied by the Tees-side Bridge and Engineering Works, Limited.

Personal

MR. CHARLES MELVILLE MCLAREN has been elected a director of John Brown & Company, Limited.

MR. GEORGE RUSTON SHARPLEY, managing director of Ruston & Hornsby, Limited, has been elected chairman of the company to succeed the late Colonel J. S. Ruston.

MR. C. REED, melting-shop manager, has been appointed works manager of the Skinningrove Iron Company, Limited, in succession to Mr. J. L. Adamson, who recently resigned.

MR. FRANK WAIN, managing director of the Britannia Tube Company, Limited, Birmingham, has been elected President of the Birmingham Chamber of Commerce, in succession to the Earl of Dudley.

MR. DAVID SILLARS, formerly works manager of Warner & Company, Limited, Cargo Fleet, Middlesbrough, has been appointed joint managing director in place of Mr. R. G. Sillars, who recently resigned. Mr. H. Wilton has been appointed works manager.

MR. GORDON DUGUID, who has for many years represented Thomas E. Gray & Company, Limited, of London, has now joined the sales staff of the Midland Monolithic Furnace Lining Company, Limited, of Leicester, as their Midlands representative.

MR. E. E. HULBERT, who has just retired from the position of secretary with Joseph Berry, Limited, ironfounders, of Swinton, Lancs, after over 36 years' service with the firm, has been the recipient of a silver tea service from his staff colleagues and the workmen. Mr. Hulbert is succeeded by Mr. A. Gates.

Obituary

MR. WILLIAM WILSON, who was for many years in the service of Stewarts and Lloyds, Limited, with whom he served for some 25 years in India, and later at Glasgow, died in Grieff on June 1, aged 66.

New Companies

(From the Register compiled by Jordan & Sons, Limited, Company Registration Agents, 116 to 118, Chancery Lane, London, W.C.2.)

Uniloy, Limited, 38, Union Street, Bradford.—Capital, £100. Metal workers, etc. Directors: S. and N. Burras.

Unimetal Industries, Limited, 22, Basinghall Street, E.C.2.—Capital, £5,000. Manufacturers of and dealers in ferrous and non-ferrous metals, etc.

C. Eastgate & Son, Limited.—Capital, £3,000. Brassfounders. Directors: C. J. Eastgate, 26, Hampton Road, Handsworth, Birmingham, and G. Eastgate.

A.R.P. Lectures

Lectures on air-raid precautions are to be delivered this month at meetings of the Institution of Civil Engineers. On Tuesday, June 6, Dr. R. E. Stradling, chief adviser, Research and Experiment, A.R.P. Department, Home Office, lectured on experimental work on A.R.P. On Monday, June 12, Col. F. J. Wyatt, of the Royal Aircraft Establishment, Farnborough, will discuss camouflage, and on Tuesday, June 20, Dr. David Anderson, Chairman, Design Panel, Engineering Precautions (Air Raid), Committee, will lecture on the design of bomb-proof shelters. A fourth lecture has also been arranged on the duties which a civilian engineer may be called upon to carry out when working with military engineers in war; this will be delivered on Tuesday, June 27, by Brigadier C. A. Bird, D.S.O., Chief Engineer, Aldershot Command, under the title of "The Work of the Military Engineer in War."

Company Reports

J. Brockhouse & Company, Limited.—Interim dividend of 7½ per cent.

Kayser, Ellison & Company, Limited.—Interim dividend of 5 per cent., less tax.

Electric Furnace Company, Limited.—Dividend of 4½ per cent., making 7 per cent. for the year.

Crompton Parkinson, Limited.—Interim dividend of 7½ per cent. on ordinary and "A" ordinary shares.

Whessoe Foundry & Engineering Company, Limited.—Dividend of 40 per cent. for the year ended March 31.

Allied Ironfounders, Limited.—Profit, £198,428; final dividend on the ordinary shares of 5 per cent., making 9 per cent. for the year.

International Diatomite Company, Limited.—Net profit of £8,262 for the nine months to March 31 last; dividend of 4 per cent.; carried forward, £3,749.

Stewarts and Lloyds of South Africa, Limited.—Dividend at rate of 6 per cent. per annum on the first cumulative preference shares for the half-year to June 30, 1939.

Incandescent Heat Company, Limited.—Net profit for the year ended December 31, 1938, £10,587; brought in, £20,179; available, £30,766; written off patents account, £25,000; carried forward, £5,766.

John Brown & Company, Limited.—Final dividend of 1s. 3d. a share, tax free, making 1s. 9d. a share. Net profits for the year, after charging directors' fees, debenture interest, depreciation, and providing for income-tax and N.D.C., £550,682.

Morgan Crucible Company, Limited.—Profit for the 15 months ended March 31 last, £584,406; brought in, £104; taxes, £157,980; preference dividends, £98,736; interest on 5 per cent. obligations, £15,646; final dividend of 1s. 2d. per £ on the ordinary stock, making 1s. 11d. for the 15 months; applied in the capitalisation of 5 per cent. obligations to be retained for employment in the business, £161,850; carried forward, £362. Meeting, June 12.

Ruston & Hornsby, Limited.—Net profit for the year ended March 31 last, including dividends receivable from subsidiary and associated companies, and after charging debenture interest, £301,406; brought in, £61,800; reserves for contingencies, £50,000; dividends on the 5 and 6 per cent. preference stocks, £23,500; dividend of 12½ per cent. on the ordinary stock, £153,750; to pension reserve, £10,000; to taxation reserve, £20,000; to general reserve, £50,000; carried forward, £55,956.

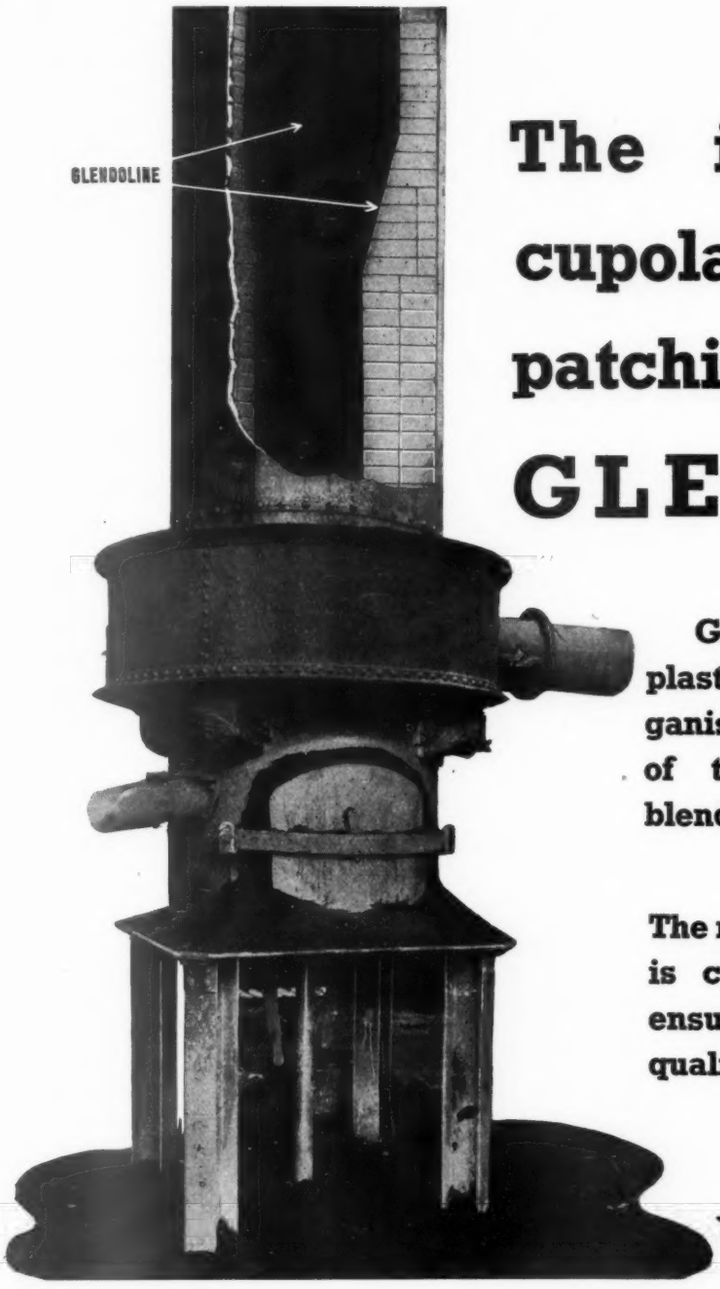
Company Meetings

Peter Brotherhood, Limited

Presiding at the annual meeting of Peter Brotherhood, Limited, engineers and ironfounders, of Peterborough, MR. A. M. NEAL (chairman) reported that they still had a large volume of orders for both Government and commercial work upon their books. They must bear in mind, however, that much of the work at present in hand was placed with them some months ago by Government Departments and by commercial undertakings at fixed prices, and would have to bear the full load of the recent increased wages award and of any other increases which might be agreed during the year. The ratio of commercial to Government work, at the moment, was in the region of roughly 40 per cent. commercial to 60 per cent. Government work. They were anxious to continue their part in assisting the country in its rearmament policy, but the board had constantly in mind the necessity of maintaining, and indeed increasing, their commercial connections.

Smethwick Drop Forgings, Limited

Reporting a decline in trading profits at the annual meeting of Smethwick Drop Forgings, Limited, MR. R. G. SIMPSON (chairman) said that last year he had stated that they had had evidence of over-buying, and in the circumstances the profit now reported was satisfactory. Their subsidiary, the Smethwick Stamping Company, had consistently made a satisfactory profit since they had acquired that undertaking. They had expended a substantial sum in connection with the equipment of a department for the production of light alloy castings. They found an increasing demand for that class of forgings in the aircraft industry as well as in other directions.



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Raw Material Markets

There continues to be a noticeable absence of forward buying in the foundry-iron market, and consumers are content to satisfy their requirements as they arise. Other sections of the iron and steel markets are very active, and producers are working to capacity. While the demand for raw material in connection with the rearmament programme continues to account for the bulk of the production, there is an increasing number of orders for commercial work.

Pig-Iron

MIDDLESBROUGH. — Business in Cleveland foundry iron has continued to be within narrow compass, and the current small output is more than sufficient to meet inquiries. Were producers to make an announcement in regard to future prices, consumers would probably react accordingly and secure their requirements over a few months ahead. Nevertheless, users' needs at the present time are comparatively small, and although the light-castings trade has recently shown some improvement, this section is still badly placed for work. For delivery in the Middlesbrough or Falkirk areas, No. 3 Cleveland G.M.B. foundry iron is quoted at 99s. per ton, No. 1 foundry 102s., and No. 4 foundry and No. 4 forge iron 98s., all less 5s. per ton rebate.

Lower prices for hematite come into operation at the end of this month, but meanwhile some consumers are accepting deliveries at the higher quotations, as they have not sufficient material on hand to meet current requirements. Generally, however, trade is quiet; consumption is well maintained, but buyers naturally are not disposed to make purchases until after the turn of the month. Producers have heavy stocks and are selling to foreign consumers at prices below those quoted for home business, which for East Coast mixed numbers are 120s. delivered on the North-East Coast, 125s. 6d. in Sheffield, and 131s. in the Midlands.

LANCASHIRE.—Apart from machine-tool makers and the heavy electrical engineering trade, the call for supplies of pig-iron is still at a low ebb. These consumers are busy and are likely to continue to be so for a considerable time to come, but textile-machinery makers and light-castings founders, on the whole, are quietly placed for new business and their requirements of foundry iron are small. For delivery to consumers in the Lancashire price zone, Staffordshire and Derbyshire brands of No. 3 foundry iron equal to Derbyshire are quoted on the basis of 102s. 6d., with Derbyshire forge iron at from 101s. to 102s. 6d., according to the class of consumer. Owing to the imminence of price reductions, the demand for hematite has been on the quiet side.

MIDLANDS.—The light-castings trade should now be well employed, but such is not the case, and there has been very little improvement from the slack period in the winter. Consequently, the demand for foundry iron from this source continues to be at a low level, and the position is very unsatisfactory. Other users of high-phosphorus iron are also rather quiet. For delivery to Birmingham and Black Country stations, Derbyshire No. 3 foundry iron is quoted at 101s., with Northamptonshire No. 3 at 98s. 6d., both less 5s. rebate. Most consumers of low-phosphorus iron are well covered for supplies, but deliveries are being called for at a good rate, and much of the iron is being used by concerns engaged on Government work. The hematite section of the trade is fairly satisfactorily situated, but consumers are not now buying substantial tonnages, in view of the lower quotations which come into operation at the end of the month.

SCOTLAND.—Stocks of foundry iron are ample to meet current requirements, and, owing to the uncertainty regarding future prices, buyers are not committing themselves very far ahead. Many consumers, too, are not in possession of well-filled order-books. This particularly applies to the makers of light castings. No. 1 foundry iron is quoted at 108s., with No. 3 at 105s. 6d., both f.o.t. furnaces. There continues to be a strong demand for hematite and basic iron from the local steelworks, which are very busily employed. Mixed numbers of hematite are quoted at 120s. 6d. and basic at 92s. 6d., both less 5s. per ton rebate, delivered.

Coke

Uncertainty still exists as to the level of foundry-coke prices after the end of the present month. There is much conjecture on the subject; some consumers believe that there will be a reduction, but, on the other hand, the market has been more active of late. Foundries and steelworks are taking up heavy tonnages, while the call for coke from abroad has been quite strong. Meanwhile, the minimum price for both Durham and Welsh coke is 50s. 6d. per ton, delivered to Birmingham and district.

Steel

Structural steel has recently improved in demand to a very pronounced extent and supplies are not always freely available. Rollings at the works in many instances have become much less frequent and delays in deliveries are quite common. Steel strip and small bars are well accounted for, but many re-rollers are handicapped owing to the absence of adequate supplies of billets. Air-raid shelters continue to account for large tonnages of sheets, and makers are well booked up for some time to come. In many cases deliveries are behind schedule and new business can only be accepted for long dates. Government work continues to keep many steel plants fully occupied and commercial work, which is now more plentiful, cannot always be fitted in without delay.

Scrap

While supplies of scrap suitable for ironfoundries are coming through fairly well on the whole, there is still a marked shortage of scrap for the steelworks. In some cases the works are producing large tonnages of scrap themselves, all of which finds a ready outlet in their own furnaces. The position would no doubt be relieved by the arrival of material from abroad, but so far deliveries from other countries have not been very heavy. More of the material which was recently bought by the British Iron & Steel Corporation should shortly arrive from the United States.

Metals

Although the international situation no longer gives cause for immediate anxiety, consumers of non-ferrous metals are still not disposed to buy forward to any extent.

Copper.—The tone of this market has been quite firm and buying has been moderately good. The Continent, especially, has been in the market for substantial tonnages. On the whole, however, business has not been so satisfactory as might be expected, in view of the fact that many of the larger users are very busy.

Metal Exchange quotations were as follow :—

Cash.—Thursday, £42 8s. 9d. to £42 10s.; Friday, £42 7s. 6d. to £42 10s.; Monday, £42 7s. 6d. to £42 8s. 9d.; Tuesday, £42 3s. 9d. to £42 5s.; Wednesday, £42 6s. 3d. to £42 8s. 9d.

Three Months.—Thursday, £42 16s. 3d. to £42 17s. 6d.; Friday, £42 15s. to £42 16s. 3d.; Monday, £42 15s. to £42 16s. 3d.; Tuesday, £42 10s. to £42 11s. 3d.; Wednesday, £42 12s. 6d. to £42 13s. 9d.

Tin.—A substantial reduction in stocks of tin during the month of May has given rise to the suggestion that the output quota may again be increased. According to the statistics compiled by Mr. W. H. Gartsen (Henry Rogers, Sons & Company), the total visible supply on May 31 was 23,813 tons, as compared with 25,574 tons on April 30. The carry-over in the Straits Settlements was 4,772 tons on May 31, against 5,042 tons at the end of April, while the carry-over at the Arnhem (Holland) smelter was 537 tons lower on the month. Thus, there was an aggregate decline of 2,568 tons during May. This was more or less in accordance with expectations and had been discounted by the market.

Official quotations were as follow :—

Cash.—Thursday, £226 15s. to £227; Friday, £227 to £227 5s.; Monday, £226 5s to £226 10s.; Tuesday, £225 10s. to £225 15s.; Wednesday, £225 15s. to £226.

Three Months.—Thursday, £224 10s. to £224 15s.; Friday, £224 10s. to £224 15s.; Monday, £224 to £224 5s.; Tuesday, £223 5s. to £223 10s.; Wednesday, £223 10s. to £223 15s.

Spelter.—The market is firm and quite a strong trade demand has been noticeable during the week. The galvanisers are busy on Government work which involves the use of substantial supplies of zinc. Nothing yet appears to have been done in connection with the efforts to re-establish the International Zinc Cartel following the raising of the import duty on zinc, but it is expected that negotiations will shortly commence.

Daily market prices :—

Ordinary.—Thursday, £14; Friday, £14 2s. 6d.; Monday, £14; Tuesday, £14; Wednesday, £14 2s. 6d.

Lead.—With the armament makers taking up heavy tonnages of this metal, the tone of the market is fairly strong, but most other consumers are not well placed for work. In fact, many commercial concerns are showing little interest in new business at the present time.

Day-to-day quotations :—

Soft Foreign (Prompt).—Thursday, £14 10s.; Friday, £14 12s. 6d.; Monday, £14 10s.; Tuesday, £14 6s. 3d.; Wednesday, £14 7s. 6d.

Scrap.—There has not been much improvement in this section of the market, and the turnover continues to be rather disappointing. Approximate selling prices for old metal:—New aluminium cuttings, £69; rolled, £57; cast, £30 to £35; foil, £80. Copper, £38 to £43; braziery, £36. Brass (clean), £22 to £25. Zinc, £10. Lead, £13 10s. Gunmetal, £38.

MACHINERY—*Continued from page 38*

CUPOLAS

6 ft. dia., 10 tons per hr. (AS NEW.)
4 ft. 6 in. dia., 5 tons per hr.
3 ft. 6in. dia., 3 tons per hr.
3 ft. dia., 2 tons per hr.
2 ft. 6 in. dia., 15 cwts. per hr. Cupolette.

PNEUMATIC MOULDING MACHINES

Macdonald No. 9 Ajax Turnover, table 39 in. by 33 in.
Macdonald Jolter, table 72 in. by 54 in.
Tabor 16-in. Shockless, table 72 in. by 48 in.
Tabor Portable Shockless Rollover, table 40 in. by 30 in.
Tabor Ditto, table 27 in. by 20 in.
Universal Type "P" Jolt Squeeze, table 24 in. by 17 in.
Zimmermann Type P.1 Portable Jolt Squeeze.
Zimmermann Type R.P.W.2 Jolt Squeeze Turnover, table 36 in. by 20 in.

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